THIRTEENTH INTERNATIONAL DAIRY CONGRESS

Held at The Hague, Netherlands, June 22-26, 1953

REPORT OF

THE DELEGATION OF THE UNITED STATES

TO THE SECRETARY OF STATE

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Bureau of Dairy Industry
Washington 25, D. C.

LETTER OF SUBMITTAL

The Honorable
The Secretary of State
Washington, D. C.

Dear Mr. Secretary:

We have the honor to submit herewith a report of the participation in the Thirteenth International Dairy Congress by the delegates representing the Government of the United States.

The Congress was held at The Hague, Netherlands, from June 22-26, 1953, and the delegates of the United States to the Congress were designated under the authority of the President by the Department of State on April 8, 1953, pursuant to an invitation from the Government of the Netherlands to the Government of the United States to participate in this Dairy Congress. The appointments were transmitted to us by you.

The report herewith summarizes the work of the Congress and gives a brief account of the participation by delegates and individuals from the United States. The report also contains a special article pertaining to the Dutch dairy industry.

Respectfully submitted.

R. E. Hodgson, Chairman
Robert A. Brand, Secretary

December 1, 1953

CONTENTS

CONTENTS

THIRTEENTH INTERNATIONAL DAIRY CONGRESS

The Hague, Netherlands, June 22-26, 1953

REPORT OF THE UNITED STATES DELEGATION

BACKGROUND

The Thirteenth International Dairy Congress was held at The Hague, Netherlands, June 22-26, 1953. The Congress was organized by the Netherlands National Committee of the International Dairy Federation, with the approval of the Netherlands Government and under the distinguished patronage of H. R. H. Prince Bernhard of the Netherlands.

The Thirteenth Congress was held in the fiftieth anniversary year of the International Dairy Federation, its sponsoring organization. The International Dairy Federation was organized in 1903, when the first International Dairy Congress was held in Brussels, Belgium.

The Federation has its headquarters in Brussels. The aim of the Federation is, to quote, "to promote the solution of international scientific, technical, and economic dairy problems, in the interests of humanity as a whole. The Federation studies economic questions solely from the angle of applied science, and its work is not influenced by commercial or political considerations."

The International Dairy Federation organizes International Dairy Congresses as one means of achieving its objectives. Congresses are held about every 3 years, usually in the capital of one of the member countries. Nineteen nations are now members of the Federation, as indicated on pages 4 and 5. Data concerning congresses held in the past are given in the following table:

Congress	Place	Date	Sections	Papers	Countries officially represented	Number of participants
I	Brussels	Sept. 8-11, 1903	3	57	16	700
II	Paris	Oct. 16-19, 1905	6	48	17	1,170
III	The Hague	Sept. 16-20, 1907	3	60	21	900
IV	Budapest	June 6-11, 1909	3	67	20	1,020
V	Stockholm	June 28-July 1, 1911	2	52	23	900
VI	Berne	June 8-10, 1914	4	54	28	894
VII	Paris	May 16-19, 1926	7	78	27	1,500
VIII	London	June 26-July 12, 1928	7	92	-	1,980
IX	Copenhagen	July 13-17, 1931	5	145	52	2,092
X	Rome/Milan	April 30-May 6, 1934	7	213	-	2,600
XI	Berlin	Aug. 22-28, 1937	4	413	53	3,638
XII	Stockholm	Aug. 15-19, 1949	6	416	60	2,190

A world dairy congress was held in the United States in 1923, at Washington, D. C., Philadelphia, Pa., and Syracuse, N. Y. Although the United States has never been a member of the International Dairy Federation, many of the member nations sent official delegations to the 1923 congress; and the United States sent official delegations to all congresses beginning with the Eighth, in 1928.

AMERICAN PARTICIPATION IN THE THIRTEENTH CONGRESS

On September 15, 1952, the Netherlands Government extended an invitation to the United States Government to send delegates to take part in the Thirteenth International Dairy Congress, which was to be held at The Hague in June 1953 and which was then being organized by the International Dairy Federation under the distinguished patronage of H. R. H. Prince Bernhard and with the support of the Netherlands Government.

This invitation, transmitted to the Secretary of State from the Netherlands Ambassador on behalf of the Netherlands Government, was referred to the Secretary of Agriculture, who recommended to the Secretary of State that an official delegation be appointed to attend the Thirteenth International Dairy Congress.

Official Delegates of the United States of America to the Thirteenth International Dairy Congress

Upon recommendation of the Secretary of Agriculture the following delegates were named by the President, and the Secretary of State notified them of their appointments:

Dr. Ralph E. Hodgson, Assistant Chief, Bureau of Dairy Industry, Agricultural Research Administration, United States Department of Agriculture, Washington, D. C., who also acted as chairman of the delegation.

Robert A. Brand, Second Secretary of the American Embassy, The Hague, who also acted as secretary of the delegation.

Col. Benjamin F. Castle (retired), Executive Director, Milk Industry Foundation, Washington, D. C.

Dr. Charles W. England, Director of Research, C. Y. Stephens Dairy Industries, Washington, D. C.

B. S. Graham, Executive Secretary, Central Oklahoma Milk Producers Association, Oklahoma City, Oklahoma.

T. Kline Hamilton, Past President, Milk Industry Foundation, Columbus, Ohio.

Milton Hult, President, National Dairy Council, Chicago, Illinois.

Dr. Otto F. Hunziker, Consultant and Expert in Dairy Products, La Grange, Illinois.

Dr. Eugene L. Jack, Head, Division of Dairy Industry, University of California, Davis, California.

James C. Norgaard, General Manager, Farmers Union Co-operative Creamery Company, Superior, Nebraska.

Lester S. Olsen, President, Olsen Publishing Company, Milwaukee, Wisconsin.

Arthur C. Ragsdale, Chairman, Department of Dairy Husbandry, College of Agriculture, University of Missouri, Columbia, Missouri.

Dr. Frank E. Rice, Executive Secretary, Evaporated Milk Association, Chicago, Illinois.

Dr. Harry C. Trelogan, Dairy Economist, Assistant Administrator for Marketing, Agricultural Research Administration, United States Department of Agriculture.

Dr. George M. Trout, Professor of Dairy Husbandry, Michigan State College, East Lansing, Michigan.

Dr. Herman D. Weihe, Dairy Scientist, Bureau of Dairy Industry, Agricultural Research Administration, United States Department of Agriculture.

Individuals from the United States of America Who Attended the Thirteenth Congress

In addition to the official delegates representing the United States government, many representatives of State and commercial dairy organizations and State agricultural colleges and experiment stations attended the Thirteenth International Dairy Congress at the Hague. The following list of individuals from the United States who attended the Congress also includes the official delegates:

R. A. Brand, American Embassy, The Hague, Netherlands
R. D. Britton, New York City
Mrs. Britton
B. F. Castle, Washington, D. C.
C. W. England, Washington, D. C.
C. P. Fossum, The Hague, Netherlands
W. A. McGill, Poughkeepsie, New York
N. S. Golding, Pullman, Washington
B. S. Graham, Oklahoma City, Oklahoma
G. P. Gundlach, Cincinnati, Ohio
Mrs. Gundlach
D. M. Gwinn, Philadelphia, Pennsylvania
Mrs. Gwinn
H. W. Habig, Englewood, New Jersey
Mrs. Habig
C. V. Hansen, Sacramento, California
Mrs. Hansen
A. P. Hawkins, Memphis, Tennessee
R. E. Hodgson, Washington, D. C.
Mrs. Hodgson
G. A. Houran, Poughkeepsie, New York
Milton Hult, Chicago, Illinois
Mrs. Hult
O. F. Hunziker, LaGrange, Illinois
E. L. Jack, Davis, California
Mrs. Jack
G. S. McKenzie, Los Angeles, California
Mrs. McKenzie
T. Kline Hamilton, Columbus, Ohio
Mrs. Hamilton
J. C. Norgaard, Superior, Nebraska
Mrs. Norgaard
L. S. Olsen, Milwaukee, Wisconsin
Mrs. Olsen
R. B. Price, El Paso, Texas
Mrs. Price
A. C. Ragsdale, Columbia, Missouri
Mrs. Ragsdale

F. E. Rice, Chicago, Illinois
Mrs. Rice
Robert Rosenbaum, Philadelphia, Pennsylvania
Mrs. Rosenbaum
B. A. Stein, Madison, Wisconsin
Mrs. Stein
Miss N. Stein
H. Swan, Dallas, Texas
Mrs. Swan
H. C. Trelogan, Arlington, Virginia
Mrs. Trelogan
G. M. Trout, East Lansing, Michigan
Mrs. Trout
H. D. Weihe, Washington, D. C.
Mrs. Weihe

COUNTRIES PARTICIPATING IN THE THIRTEENTH CONGRESS

Thirty-eight countries were represented at the Thirteenth International Dairy Congress. In addition, the ECA, FAO, FIPA, ICE, ISO, UNICEF, and the Permanent Committee of the International Veterinary Medical Congress were represented. Following is a list of the countries and organizations, and the number of delegates and other participants from each:

Country	Delegates (number)	Other Participants (number)
Argentina	-	1
*Australia	5	22
*Austria	4	34
*Belgium	11	63
*Canada	1	10
Cuba	-	1
*Denmark	17	221
El Salvador	1	-
*Finland	-	57
*France	-	190
*Germany	-	262
*Great Britain	14	295
Greece	-	1
India	4	5
*Ireland	4	22
*Israel	-	5
*Italy	2	56
Japan	1	8
Kenya	-	1
*Luxemburg	4	8
Mauritius	-	1
*Netherlands	-	295
*New Zealand	2	3
*Norway	6	88
Peru	1	-
Poland	-	3
Portugal	-	6
San Marino	-	2

Country	Delegates (number)	Other Participants (number)
South Africa	1	4
*Spain	1	23
*Sweden	7	156
*Switzerland	2	89
Uruguay	1	-
United States	16	35
Venezuela	1	-
Yugoslavia	1	1
Total	107	1,968
Organization		
ECA	2	2
Permanent Com. of Int'l. Vet. Med. Cong.	-	1
FAO	3	1
FIPA	1	-
IOE	1	-
ISO	1	1
UNICEF	2	-
Total	10	5

*Countries marked with an asterisk are members of the International Dairy Federation.

ORGANIZATION OF THE THIRTEENTH CONGRESS

As mentioned in the background statement, the Thirteenth International Dairy Congress was organized by the Netherlands National Committee of the International Dairy Federation, with the approval of the Netherlands Government. President of the Congress was Dr. J. Linthorst Homan, Ex-President of the Royal Netherlands Dairy Union; Vice-President was G. J. Blink, President of the Dutch Dairy Industry and Milk Hygiene Association; and General Secretary was G. H. Hibma, Secretary of the Central Dairy Commission of the Netherlands.

The executive work of organizing the Congress was under the direction of the Congress Management, which consisted of a chairman, vice-chairman, secretary, and 13 members. The president, vice-president, and general secretary of the Congress served also as chairman, vice-chairman, and secretary of the Congress Management.

The Congress Management carried out their work through 5 committees, as follows: (1) Committee for the Sessions, (2) Committee for the Excursions, (3) Public Relations Committee, (4) Finance Committee, and (5) Ladies' Committee.

The Congress was organized for the sole purpose of presenting technical information on dairying throughout the world. There were no committees of the Congress itself. However, the Commission of Studies of the International Dairy Federation met at intervals throughout the course of the Congress. As the United States is not a member of the International Dairy Federation, the United States delegation was not involved in these meetings.

The program for the presentation and discussion of the scientific papers was carried out under 5 general sections, as follows:

Section I.- Milk as a raw material
Section II.- Processing and utilization of milk
Section III.- Equipment and buildings
Section IV.- Fundamental research
Section V.- Economics

Section I dealt with 4 subjects; section II, with 6 subjects; and sections III, IV, and V, each dealt with 5 subjects.

A chairman and two vice chairmen were assigned to each section, to preside at all the sessions in that section. A general reporter was assigned for each subject in the various sections. He prepared a brief review of the subject under discussion, based on his personal experience and a study of the contributions, which usually included a summary of the most important developments during the past few years and concluded with a forecast of the future. Two discussion leaders were assigned to each subject, to open the discussion from the floor. The discussions from the floor were fully documented and will appear in the Congress proceedings.

In addition to the subjects discussed under the 5 sections, the program included 5 general lectures of special importance to the dairy industry, as follows:

General Lecture I.- The udder and how it functions -- some modern views, by H. D. Kay, of Great Britain.

General Lecture II.- The milk industry and the milking machine, by J. Keilling, of France.

General Lecture III.- The economics of the dairy industry, by A. Hilding, of Sweden.

General Lecture IV.- The future of butter, by L. P. Frederiksen, of Denmark.

General Lecture V.- Milk and milk products in tropical countries, by Dr. D. N. Khurody, of India.

A feature of the closing session was a special lecture on "The Production and Distribution of Dairy Products," by A. H. Boerma, Director of the Economics Department of F.A.O.

Scientists and technologists from 23 countries submitted a total of 327 papers for discussion at the Congress. These included the "reports" of the official reporters assigned to each subject; "contributions," which dealt with subjects on the agenda of the 5 sections, and "communications," which related to questions discussed in one of the sections but were not directly concerned with a subject mentioned in that section.

Simultaneous interpretation was provided at all the sessions, so the lectures and discussions could be heard in English, French, and German.

The United States delegation met before the opening of the Congress to develop a procedure for covering the various sessions and general lectures. One or more delegates were assigned to attend each session. The assignments were made so that each delegate attended sessions that dealt with subjects in his particular field of interest.

CONGRESS SESSIONS AND EVENTS OF INTEREST

The session meetings of the various sections of the Congress were held in the Palace Hotel and the Kurhaus Hotel at Scheveningen(the seaside suburb of The Hague) from June 22-26, mainly in the mornings.

On Tuesday, Wednesday, and Thursday (June 23-25), there were afternoon excursions, primarily intended as sightseeing trips to enable those

attending the Congress to become acquainted with dairy activities in all parts of Holland. The characteristic cheese markets, dairy plants, marketing associations, dairy herds and farms, and below-sea-level farming areas were among the many points of interest.

On Tuesday, Wednesday, and Thursday (June 23-25), there were afternoon excursions to Amsterdam, Rotterdam, Gouda, The Hague, Westland, and "The Windmill Tour." On Friday, June 26, there was an all-day excursion to Alkmaar and vicinity; and on Saturday, June 27, an all-day tour to "The Newest Land."

In addition, there were 4 post-congress excursions lasting from 4 to 7 days. These excursions included the tour around the Zuider Zee (4 days); through Central and Northern Holland (5 days); through Central and Southern Holland (5 days); and the complete Netherlands tour (7 days).

The tours were regarded as an integral part of the Congress end were exceedingly well organized to acquaint participants with the Netherlands and its dairy industry.

Receptions and Entertainment for Visiting Delegates

On Monday evening, June 22, all delegates to the Congress (and the ladies accompanying them) were guests of the Netherlands Government and the Municipality of The Hague at a concert given by the Residency Orchestra in the Building of Arts and Sciences, The Hague. Refreshments were served during the intermission.

On Tuesday evening, June 23, the Congress Management gave a dinner at the Wittebrug Hotel, The Hague, for a limited number of special guests.

On Tuesday evening, June 23, all those attending the Congress were invited to fireworks display on the Boulevard at Scheveningen.

On Thursday evening, June 25, all those attending the Congress were guests at a reception given by the Congress Management in the "De Witte" Club, 24 Plein, The Hague. Refreshments and music for dancing were provided.

All delegates to the Congress (and their ladies) had free access to the Beach Pavilion of the "De Witte" Club at Scheveningen.

Exhibitions

At the request of the Congress Management, the Netherlands Dairy Bureau organized a National Dairy Show. This show, called Den Milkweg, or "The Milky Way," was held in the Houtrust Hall, The Hague, from June 20 to June 30. It was a unique and outstanding exhibition depicting in a most effective manner the nature and importance of the dairy industry in the Netherlands. The wide range of technical and economic displays were open to the public and were so well portrayed that more than 5,000 people were paying 1 guilder admission per day to see them. Congress members were admitted free.

This was an educational exhibit, which utilized subtle promotional techniques that could well be adopted elsewhere, including the United States. By creating a better understanding of the methods, practices, trade and scope of the industry, effective promotion was achieved in a fascinating and artistically delightful manner. The originality apparent throughout was impressive and held the interest of every visitor for several hours.

One feature of the show was a new color film dealing with the Dutch dairy industry that was on view for the first time.

The importance of dairying in the economy of the Netherlands cannot be overstated. It points up the dependence of the Nation on its ability to export dairy products and compete in world markets.

The International Dairy Machinery Fair was organized by the Royal Netherlands Industries Fair, in cooperation with the Association of Dutch Manufacturers of Dairy Equipment and the United Dairy Machinery Importers and Merchants. This trade fair, which was held in the new Bernhard Hall, Croeselaan, Utrecht, from June 19 to June 30, followed the conventional pattern of an industry exposition. While it was considerably smaller in size than similar expositions held in the United States or Canada every other year, more countries were represented and a wider variety of types of equipment was on display. Processing and delivery equipment long since outmoded in the United States was displayed side by side with some of the most modern machinery to be found anywhere.

The Storch process for preparing bottled sterilized milk was displayed prominently. Use and acceptance of bottled sterilized milk is widespread in Europe, as compared with the United States, for two reasons: (1) The unsatisfactory refrigeration facilities in the average European home preclude the keeping of fresh milk; and (2) Europeans are accustomed from long usage to the strongly cooked flavor of sterilized milk. It is unlikely that this product will become popular in the United States unless a method is developed for sterilizing milk without the accompanying objectionable cooked flavor, or for treating the milk so that a cooked flavor does not develop on sterilizing.

One or two new and possibly revolutionary items were presented. For example, a continuous operation for making and filling paper containers suitable for milk and cream. The paper fed into the machine from a roll, was molded into a circular column which was filled with liquid and sealed at regular intervals according to the size of container desired. It was then cut at the sealed points resulting in triangular unit containers that were very light and handy for packing in bags or crates for delivery to stores. The containers could be opened at any corner by cutting or tearing the paper and could then be placed on any flat surface without spilling. This tetrahedron milk or cream package would appear suitable for small dairies confronted with the necessity of using paper packages or going out of business. The machine was relatively simple and inexpensive.

The exhibit as a whole was well organized and attractively presented, featuring well finished metal equipment unsurpassed anywhere. It reflected the ability of European industry to compete with other highly industrialized nations and to adapt machinery to the wide variety of dairy conditions found in different countries.

The Ladies' Program

The Hague Hostesses Committee arranged special events each day for the ladies who accompanied the delegates to the Congress.

On Monday, June 22, the ladies were guests of the Congress Management at an afternoon tea in the Corvette Restaurant, Kurhaus Hotel. An address of welcome was given by Mrs. J. Schiff-Roosenburg, President of the Hague Hostesses Committee.

Special morning sightseeing tours were arranged for the ladies. On Tuesday, June 23, they visited "Madurodam" (miniature city) and the Mauritshuis Art Gallery; on Wednesday, June 24, the Peace Palace and the Municipal Museum; and Thursday, June 25, they visited Delft.

OPENING OF THE CONGRESS

The Thirteenth International Dairy Congress was opened at a general plenary session on Monday, June 22, 1953, at 11 a.m., in the Kurhaus Hotel, Scheveningen. More than 2,000 dairy scientists, dairy farmers, and commercial dairymen representing 36 countries were present. Dr. J. Linthorst Homan, President of the Congress, gave the welcoming address.

Dr. Homan then presented H. R. H. Prince Bernhard, who formally opened the Congress. Addresses were given also by Prof. R. Mork, President of the International Dairy Federation, and Hon. S. L. Mansholt, Netherlands Minister of Agriculture, Fisheries and Food.

The Rotterdam Philharmonic Orchestra furnished music at the opening session.

A report of the sessions follows.

SECTION I.- MILK AS A RAW MATERIAL

Prof. Dino Nai, of Italy, was chairman of the sessions under Section I; and L. P. Frederiksen, of Denmark, and A. Conix, of Belgium, were vice-chairmen.

Fifty-six papers (4 reports, 48 contributions, and 4 communications) were submitted under Section I, Milk as a Raw Material. The subject matter was presented under 4 subjects, as follows:

Subject 1.- Influence of the feeding and management of the cow upon the quality of the milk (with particular reference to suitability for processing).

Subject 2.- Production of bacteriologically good milk (steps to be taken at farm; installations at farm).

Subject 3.- Avoidance of deterioration in quality of milk during transportation (from receiving center to creamery or distributing center, and from one creamery to another); equipment used for transportation, and the cleaning of such equipment.

Subject 4.- Procedures (chemical and bacteriological) for grading milk; and calculation of the monetary value of milk on the basis of its chemical composition.

Comments, Section I, Subject 1

The 17 papers that were submitted for discussion under Subject 1, Influence of Feeding and Management of the Cow Upon the Quality of the Milk (With Particular Reference to Suitability for Processing), were reviewed by the general reporter, Prof. P. Kästli, of Switzerland. S. J. Rowland, of Great Britain, and P. F. Swartling, of Sweden, presented additional information in opening the discussion on this subject. The United States delegates assigned to attend this session were Dr. R. E. Hodgson and A. C. Ragsdale.

It was brought out that feeding and management of the cow influences the chemical composition, microflora content, and quality of the milk. These variations in milk affect its value for processing.

An important finding by British workers is that the kind and quality of forage (hay) fed to cows affects the fat content of the milk. The percentage of fat in the milk was lowered when cows were fed rations that contained less than 8 pounds of hay per day. Rations that lower the percentage of fat in the milk are characterized by a low content of digestible fiber and a high content of digestible starch. These findings

are of interest to American researchers who are presently giving considerable attention to this subject.

Swedish workers have observed considerable variation in the protein content of milk. The percentage of casein in the protein was found to vary from dairy to dairy and with different seasons of the year, being low during the pasture season and high during the winter. Variation in the amount and composition of the protein influences the yield of cheese obtained from the milk. The need for better, more practical methods of estimating casein and total protein was pointed out.

The iodine number of butterfat was found to vary considerably at different seasons of the year and at different dairies during the same season. Also, the iodine number of butterfat is influenced by the breed of the cow and its feed. The iodine number of butterfat influences the character of the butter. If the iodine number is too high, the butter has a tendency to be too soft; if the iodine number is too low, the butter may be difficult to work and the finished product may be too hard and brittle. The butterfat of cows on pasture and silage tends to be softer than the butterfat of cows fed roots, low-grade hay, and concentrates.

The amount and quality (greenness) of the forage fed to dairy cows has a profound influence on the vitamin A value of the butterfat.

A report on the effect of feeding silage on the quality of milk, particularly of milk used in cheesemaking, was of considerable interest. Grass silages are reported to produce milk containing butyric-acid-forming bacteria and spores. The degree of contamination apparently depends not only on the quality and type of grass silage, but more particularly on the management methods used in feeding silage. Much of the contamination from silage may come from outside sources and not through the cow as a result of eating grass silage. This question is unsettled and requires more investigation.

Comments, Section I, Subject 2

The 14 papers that were submitted for discussion under Subject 2, Production of Bacteriologically Good Milk(Steps To Be Taken at the Farm; Installations at Farm), were reviewed by the general reporter, W. Brinckman, of Belgium. Dr. J. G. Davis, of Great Britain, and Dr. Livio Leali, of Italy, opened the discussion. The United States delegates assigned to attend this session were Dr. R. E. Hodgson and A. C. Ragsdale.

Much of the material presented was of little interest to the delegates from the United States, as we seem to have advanced beyond our European neighbors in the production of clean milk. The discussion centered on the factors involved in producing milk on the farm with a low bacteria content, and especially with eliminating coliform bacteria in raw milk. It was stated that the most important factor is the human factor. There is need for continued intensive education, backed by enforced sanitary regulations, to bring about improvement in milk quality. Healthy cows, effective cleaning and sterilization of milk utensils and milking machines, and rapid cooling and cold holding of milk are requirements in the production of high-quality milk. There is need for extending the use of cooling and refrigeration of milk on the farm in many European countries. Filtration of milk to improve its quality is not a substitute for hygienic methods for producing high-quality milk.

An American paper discussed the use of permanent milk pipelines in dairy barns, and pointed out that personnel is an important factor in the production of high-quality milk when the "cow-to-cooler" system,

permanent-type installation is used, which means that the equipment is cleaned in place without being dismantled.

Much interest was displayed in chemical cleaning and sterilizing agents. In Europe, steam and hot water are preferred over chemicals for cleaning and sterilizing dairy equipment.

Comments, Section I, Subject 3

The 5 papers that were submitted for discussion under Subject 3, Avoidance of Deterioration in Quality of Milk During Transportation (From Receiving Center to Creamery or Distribution Center, and From One Creamery to Another); Equipment Used for Transportation, and the Cleaning of Such Equipment, were reviewed by the general reporter, Dr. E. Capstick, of Great Britain. Didier Petyt, of France, and Dr. D. N. Khurody, of India, presented additional information in opening the discussion on this subject. The United States delegates assigned to attend this session were Dr. H. C. Trelogan, Dr. F. E. Rice, and A. C. Ragsdale.

Dr. Capstick supplemented his written statement with a series of observations that were designed to provoke discussion. In his written statement, he outlined steps needed to assure quality milk, but he went on to remark that poor milk will deteriorate regardless of the efficiency of transportation and that mixing of good and poor milk causes deterioration, not improvement.

He described the system of farm tanks and bulk delivery used in the United States, but unfortunately had no communication or paper on this. He emphasized the vulnerability of milk to contamination at the connecting hose and the great dependence placed on the tank truck driver who manages the hose and accepts or rejects milk offered for delivery in the truck. Citing a report emanating from California on low-quality milk caused by failure to clean farm equipment properly and failure to keep connecting and delivery equipment free of contamination, he suggested that such a system may result in lower quality milk than the can delivery system, especially where the cans are cleaned at the plant before return to the farm and are not used for anything else.

He described practices being followed in England indicating that size of road tanks was usually regulated, giving the limits of size and the construction of tanks and trucks including combination truck and rail tanks that are transferred at the rail head.

After discussing methods of sterilizing by steam, chlorine, and washing sodas, he stated that tankers are seldom cleaned properly by scrubbing and therefore are not properly sterilized. He liked the prospects of using steam power jetting to clean tanks. He also invited American comment on his observations.

In opening the discussion, Mr. Petyt was much more optimistic about the use of tanks than was Dr. Capstick. Mr. Petyt pointed out that although tank delivery is not a substitute for good milk, it avoids air contamination and is distinctly favorable from the standpoint of the milk-plant buyer and also the producer who gets paid for quality. The milking machine-tank holding and delivery combination, in his view, is closer to the natural system with no imtermediary between the udder and the recipient.

Dr. Khurody described the vastly different system that has to be used in his country. With no refrigeration facilities in small villages, no electricity, only 1 or 2 animals per farm, and with poor and dusty roads, the milk must be collected within 2 or 3 hours after

milking. If the milk is to be transported any distance, it is first pasteurized and then is put into large cans. The cans of milk are hauled in insulated vans. Trays of ice are placed on top of the cans to keep the milk cool.

Fluid milk for Bombay is loaded at a temperature of 40° and when it reaches Bombay 12 hours later, it is 10° to 12° warmer. It could be distributed in Bombay at once in loose condition, i.e., as bulk or unbottled milk, but it usually is repasteurized and bottled. It is mostly buffalo milk high in fat content but not very clean. Adulteration with water is frequent, and it is not clean water. Since buyers can't discourage watering, they are filling tanks with clean water and saying, "If you must add water, please use this water."

Dr. Trelogan responded to Dr. Capstick's invitation for American comment. He said that the most eloquent testimony he could cite of the success of the American farm tank-bulk delivery system was the rapidity with which it is being adopted in areas of relatively small farms as well as large dairy farms. He stated that scientific studies have not been able to keep abreast of the rapid changes being introduced, but that on the basis of American experience thus far, he does not share Dr. Capstick's concern that this method will lower the quality of milk.

Prof. J. J. Jacquet, of France, assured the group that quality of milk collected in tanks is good in both summer and winter. He cited bacteria counts being reduced from 17,000,000 to 600,000 in milk from the same source after tanks replaced cans. Tank milk enabled better controlled fermentation even for cheese milk where high counts are needed.

Comments, Section I, Subject 4

The 16 papers that were submitted for discussion under Subject 4, Procedures (Chemical and Bacteriological) for Grading Milk, and Calculation of the Monetary Value of Milk on the Basis of its Chemical Composition, were reviewed by the general reporter, Prof. M. T. Sode-Mogensen, of Denmark. Gunnar Aas, of Norway, and Dr. G. Posthumus, of the Netherlands, opened the discussion. The United States delegates assigned to attend this session were Dr. C. W. England and B. S. Graham.

Dye reduction methods appear to be the most commonly used methods of grading milk.

The discussion centered around the basis of payment for milk that would be most equitable. It was pointed out that fat alone can never provide a sound basis of payment. It was suggested that payment be based on both the protein content and the fat content and their relative value. It was suggested that the protein content be determined by formal titration but better methods for determining the protein content, and especially the total solids-not-fat, are needed. European and American workers have a common interest in this problem. However, paying for milk on the basis of its chemical composition depends on better methods of analysis and better use of its nonfat constituents.

SECTION II.- PROCESSING AND UTILIZATION OF MILK

Prof. A. De Vleeschauwer, of Belgium, was chairman of the sessions under Section II; and J. Love, of Australia, and Dr. W. C. Dorner, of Switzerland, were vice-chairmen.

Eighty-four papers (6 reports, 69 contributions, and 9 communications) were submitted under Section II, Processing and Utilization of Milk. The subject matter was presented under 6 subjects, as follows:

Subject 1.- Market milk; raw, pasteurized or sterilized, possibly also homogenized (attention to flavor, nutritional value, keeping qualities, micro-organisms).

Subject 2.- Concentrated milk (evaporation, freezing, drying); and reconstitution and use of concentrated milk.

Subject 3.- Use of milk in the form of other products, and possibly the preparation of these products (buttermilk, yoghurt, acidophilus milk, chocolate milk, ice cream, etc.).

Subject 4.- Changes in quality of butter during storage.

Subject 5.- Ripening of cheese (particularly development of flavor), bacteriological and chemical.

Subject 6.- Utilization of byproducts (buttermilk, separated milk, whey, etc.).

Comments, Section II, Subject 1

The 15 papers that were submitted for discussion under Subject 1, Market Milk; Raw, Pasteurized, or Sterilized, Possibly Also Homogenized (Attention to Flavor, Nutritional Value, Keeping Qualities, Micro-organisms), were reviewed by the general reporter, Dr. G. M. Trout of the United States. Prof. P. Solberg, of Norway, and J. Mol, of the Netherlands, led the discussion. The United States delegates assigned to attend this session, in addition to Dr. Trout, were Dr. R. E. Hodgson, Col. B. F. Castle, and A. C. Ragsdale.

A greater percentage of the total milk production is used as beverage (or fluid) milk in most countries than is used in making butter, cheese, concentrated milk, ice cream, and other products. Although beverage milk does not have the appeal or acceptance in European countries that it has in the United States, Europeans are giving increased emphasis to beverage milk through modernization of fluid milk equipment and procedures. Sanitary milk production is the basis of good drinking milk.

In the United States, the flavor and nutritive value of milk is kept at an unbelievably high level for long periods of time by efficient processing techniques.

High-temperature short-time pasteurization is being emphasized as the most efficient method of pasteurization. It was indicated that the pasteurizing temperature has an important influence on the keeping quality of the milk. When milk is pasteurized by the H.T.S.T. method, the milk has better keeping quality if it is pasteurized at a relatively low temperature (phosphatase reaction just negative) than if it is pasteurized at higher temperatures.

The fluid milk industry is much interested in homogenized milk, canned fresh milk, half-and-half homogenized milk, nonfat dry milk solids, fortified skimmed milk, and sterilized milk. There is a movement toward less frequent home delivery, store sales, and 6-day plant operation. American delegates were intensely interested in the extent to which sterilized bottled milk is gaining favor in Britain and Europe.

One paper dealt with the subject of sterilizing milk with hydrogen peroxide. It was pointed out that this chemical effectively sterilizes milk without undue changes in the properties of the protein and sugars and that cheese of good quality can be made by adding cultures

to the treated milk.

Comments, Section II, Subject 2

The 8 papers that were submitted for discussion under Subject 2, Concentrated Milk (Evaporation, Freezing, Drying); and Reconstitution and Use of Concentrated Milk, were reviewed by the general reporter, Dr. Frank E. Rice of the United States. Prof. E. L. Crossley, of Great Britain, and A. van Kreveld, of the Netherlands, led the discussion. Dr. E. L. Jack was assigned to represent the United States delegation at this session, in addition to Dr. Rice.

Dr. Rice pointed out that milk in its natural state is an almost universally accepted food, and the nutrients of milk are important in human nutrition. The various kinds of concentrated milk are also of great importance in human nutrition throughout the world, but their importance has not been fully recognized. Because concentrated milks are easy to transport and store and have good keeping qualities, they are especially important as a source of milk nutrients in countries where the supply of fluid milk is insufficient to meet the needs of the people.

The need for improving the quality of milk produced and handled on the farm is world wide. Improvement in quality will come about through a combination of educational programs for producers and sanitary control measures at the plant.

The importance of basic research on the complex chemical and physical structure of milk and the changes that take place during processing and storage were emphasized. In order to encourage consumer acceptance of concentrated milks, effort should be directed toward producing concentrated milks that, when reconstituted, will have the flavor and structure of fresh fluid milk.

In opening the discussion, Prof. Crossley said he considered this one of the most important sessions of the Congress. He reported on a British experiment in which school children were served beverage milk of various kinds, including different reconstituted concentrated milks as well as fresh, pasteurized milk. The milk was in unmarked bottles so the children did not know which kind of milk they were drinking. Until they were 8 years old, they accepted the milk as a beverage without question. After 8 years of age, they preferred fresh, pasteurized milk.

Application of electron microscopy can give some important information on the physical-chemical nature of milk. To prepare samples for study, H. Hostettler, of Switzerland, reported that he uses freeze drying so as not to disturb the arrangement of the particles.

The question was raised as to losses in commercial practice when milk is canned aseptically; no one was able to answer the question. However, the desirability of applying ion exchange in the commercial production of concentrated milks was questioned as the calcium content would be lowered, which would change the nutritive value of the milk. Also, there is a great chance of contamination.

A quick laboratory test to determine heat stability in milk is needed. Salt balance is important in stability, but not the whole story; a number of factors may be involved.

Comments, Section II, Subject 3

The 9 papers that were submitted for discussion under Subject 3, Use of Milk in the Form of Other Products, and Possibly the Preparation of

These Products (Buttermilk, Yoghurt, Acidophilus Milk, Chocolate Milk, Ice Cream, etc.), were reviewed by the general reporter, Prof. M. E. Schulz, of Germany. Prof. T. Storgards, of Sweden, and Dr. C. W. England, of the United States, opened the discussion. The United States delegates assigned to attend this session, in addition to Dr. England, were Dr. E. L. Jack and T. Kline Hamilton.

The discussion centered around (1) increasing sales through advertising and quality improvement; (2) correct terminology for dairy products and proper labeling of byproducts; (3) contamination control and keeping quality of byproducts; and (4) foreign fats in ice cream.

It was pointed out that the use of foreign fats in certain dairy products is quite general, and some countries do not attempt to control their use in certain frozen dairy products. A package identification mark guaranteeing the absence of foreign fats was suggested for use in countries that do not have control legislation. A suggestion was made that the International Dairy Federation study this matter and take what action seems desirable.

Extending the use of milk byproducts offers many possibilities for increasing the sale of milk constituents in many countries. Use of sour-milk products, such as buttermilk, to compete with acid and carbon dioxide-containing beverages can be developed further.

A paper by Dr. G. H. Wilster, of the United States, discussed the advantages of condensing ice-cream mixtures by means of a vacreator vacuum pasteurizer, and a paper by Dr. England,of the United States, pointed out the economic advantage of such treatment of ice-cream mixes.

Comments, Section II, Subject 4

The 12 papers that were submitted for discussion under Subject 4, Changes in Quality of Butter During Storage, were reviewed by the general reporter, Prof. K. E. Thome, of Sweden. The discussion was opened by E. Piraux, of Belgium, and Prof. W. Mohr, of Germany. Dr. H. D. Weihe, Dr. O. F. Hunziker, and J. C. Norgaard were assigned to represent the United States delegation at this session.

Prof. Thome pointed out that the most important changes that occur in butter during storage are decomposition of fat, degradation of proteins, decomposition of lactose, oxidation of fat, and oxidation of vitamins. Changes that occur in butter during storage are of microbiological and chemical origin. The changes of microbiological origin are affected by the kind and number of micro-organisms present and by the technical precautions taken during production, by any preservative used, and by storage temperature. Changes of chemical origin are influenced by light, temperature, water, air, acid, salt, heavy metals, natural and added antioxidants, treatment of the cream, and the composition and colloidal chemical structure of the butter.

The points brought out in the discussion that may have particular application in the United States are:

1. It is not necessary to store butter at the low temperatures frequently used in the United States (-15° to -30° C.), especially when the added cost of these low temperatures is considered.

2. In order to have good keeping properties, butter must have a low copper content. Satisfactory methods for determining the copper content of butter apparently are not available. A good, rapid method for determining even small amounts is needed. If such a method were available, the storage of butter with significant amounts of copper could be avoided.

3. With the growing competition from vegetable fats, such as margarine, it is becoming more and more important that only butter of excellent flavor and keeping properties be stored. This is of especial importance in the United States.

4. The addition of antioxidants to butter may not be the most desirable approach to producing high-quality butter with excellent keeping properties.

5. Storage of butter in vacuum (or inert oxygen-free atmosphere) apparently needs further investigation.

Comments, Section II, Subject 5

The 29 papers that were submitted for discussion under Subject 5, Ripening of Cheese (Particularly Development of Flavor), Bacteriological, and Chemical, were reviewed by the general reporter, Dr. J. W. Pette, of the Netherlands. P. Swartling, of Sweden, and A. P. A. Camus, of France, opened the discussion. Dr. E. L. Jack and Dr. H. D. Weihe were assigned to represent the United States delegation at this session.

There was great interest in this subject because cheese is such an important product in western Europe. The main types of investigations on ripening of cheese in recent years have been to determine the nature of the flavoring substances that are produced in various kinds of cheese (which give the cheeses their particular characteristics) and to determine the influence of bacteria and their enzymes on the production of cheese flavors. Many new techniques of analysis, such as chromatography, have been developed which should advance our knowledge of cheese-ripening. Several points of special interest were developed, as follows:

Amino acids as well as polypeptides must be considered important flavoring substances resulting from protein breakdown. The higher volatile fatty acids derived from decomposition of fat are also of great importance. The different characteristic flavors of the many types of cheese make this kind of study extremely complex.

Although it is difficult to ripen cheeses that have no surface flora (such as Gruyere, Cheddar, Gouda, and Edam) in consumer-type packages, it is possible to do so successfully. The wrapper must be an airtight, enveloping package that permits adaptation to the shape of the cheese, and it must allow for changes in the shape and size of the cheese as a result of the maturing process.

Cheddar cheese stored at relatively low temperatures will be firmer than similar cheese stored at relatively high temperatures. If there is a fluctuation in the storage temperature, there is a corresponding fluctuation in the firmness of the cheese.

Application of ultraviolet irradiation favors growth of desirable micro-organisms on Camembert cheese.

The moisture content of cheese is a decisive factor in its ripening. A rapid, objective method of determining the moisture content of cheese curd in the vat was described.

Electrophoretical investigations on different types of cheese show that the peptide fraction intermediate between casein and amino acids diminishes during ripening.

It can be concluded that the results of scientific investigations of cheese are beginning to show the chemical nature of the protein and fat derivatives that produce typical cheese flavors. The application of these scientific findings will enable the cheese manufacturer to make technical improvement and to control his process with greater surety to the end that he can make more uniform, higher quality cheese.

Comments, Section II, Subject 6

The 2 papers that were submitted for discussion under Subject 6, Utilization of Byproducts (Buttermilk, Separated Milk, Whey, etc.), were reviewed by the general reporter, Prof. P. Solberg, of Norway. Prof. M. E. Schulz, of Germany, and Prof. G. Sjostrom, of Sweden, opened the discussion. Dr. E. L. Jack, A. C. Ragsdale, and Dr. R. E. Hodgson were assigned to represent the United States delegation at this session.

Cheese whey, the byproduct of the manufacture of cheese, is an important food product in some countries, especially Norway, but in other countries it is not accepted because of the flavor and color associated with the impure, brown product. However, whey offers such a large potential supply of valuable food material, it is surprising more papers were not submitted on this subject.

A method has been developed in Holland, and is now in the pilot-plant stage, for removing most of the salts from whey by electrodialysis. (The idea for the method may have resulted from investigations begun by P. M. Peter and developed by P. D. Watson, of the United States Bureau of Dairy Industry.) The dialized whey product is a white powder that may have use in synthetic human milk formulas, which should have worldwide practical application. It also may have use as a substitute for powdered egg whites in baking, although there is some question as to whether it will retain its whipping properties under usual baking temperatures.

Considering the large amount of cheese whey available in the United States, further investigations, both fundamental and engineering, should be carried out here to supplement the work in Holland and to adapt the method for use in this country.

Of interest in the field of finding uses for cheese whey is the practical, efficient method developed by the United States Bureau of Dairy Industry for recovering the protein from Swiss and Cheddar cheese whey and converting it into a desirable cheese spread.

SECTION III.- EQUIPMENT AND BUILDINGS

Prof. A. E. Sandelin, of Finland, was chairman of the sessions under Section III, and Prof. E. Lancelot, of France, and Prof. K. Plock, of Germany, were vice-chairmen.

Forty-nine papers (5 reports, 42 contributions, and 2 communications) were submitted under Section III, Equipment and Buildings. The subject matter was presented under 5 subjects, as follows:

Subject 1.- Pasteurizers (also auxiliary equipment).

Subject 2.- Mechanization of cheesemaking.

Subject 3.- Construction of dairy equipment (with a view to cleanliness); and efficacy of cleaning methods.

Subject 4.- Economy in the use of heat, power, and labor in the dairy industry.

Subject 5.- Problems of waste water in the dairy industry.

Comments, Section III, Subject 1

The 7 papers that were submitted for discussion under Subject 1, Pasteurizers (Also Auxiliary Equipment), were reviewed by the general reporter, Prof. E. Lancelot, of France. P. Longobardi, of Italy, and H. S. Hall, of Great Britain, presented additional information in opening the discussion. The United States delegates assigned to attend this

session were Dr. H. C. Trelogan, Dr. G. M. Trout, Dr. C. W. England, T. Kline Hamilton, and J. C. Norgaard.

In his review, Prof. Lancelot observed that in general satisfactory equipment for pasteurizing milk has been developed and is available. The situation is not so favorable, however, for pasteurizing cream, especially older cream that has to be deodorized. Vacreation has been used successfully in Australia and the United States to deodorizé, but it has not been uniformly successful because composition of the odors varies. Moreover, the heavy consumption of power and water involved detracts from its usefulness in many areas. Consequently, the pasteurization of cream must be regarded as a problem not entirely solved and still open for refinement and research.

Search for entirely new techniques of pasteurization to achieve ends other than the destruction of pathological bacteria was recommended. These included: More efficient equipment adaptable to small plants; less costly equipment, especially for areas where electricity is expensive; pasteurization by non-heat techniques, such as infrared and high frequency vibrations, or perhaps ultimately atomic energy; and pasteurization of bottled milk, to avoid reinfection from harmful bacteria.

Reference was made to some refinements available for experimental work, such as the small-tube heat exchanger developed by E. O. Herreid of the United States, but the weight of discussion was on commercial pasteurization, especially in small plants. Fuller commercial use of the heat exchanger recently developed by the United States Bureau of Dairy Industry may have application here.

Several interesting points were developed during the discussion. In the opinion of Prof. Longobordi, high-temperature short-time methods of pasteurization are giving the greatest thermal efficiency, but the milk does not have the keeping quality the public has a right to expect. He expressed concern about the effect present methods have on the taste of milk and suggested the need for "rehabilitators" rather than heat pasteurizers in the quest for advantages usually sought from either lower temperature or shorter time.

In the opinion of Mr. Hall, the use of electromagnetic energy offers little promise. It is too costly because of its inefficient use of energy. Despite its low thermal efficiency, batch methods still seem best for plants of less than 500-gallon capacity.

A Swiss delegate described a new instrument called a "thermistor" that measures heat very sensitively and that could be adapted to temperature control devices to adjust equipment quickly to sudden heat changes. He felt it would be useful on pasteurizing equipment, especially continuous-flow large-capacity equipment.

An English delegate described a new step-up process using a regenerative system that is now being used in England to pasteurize milk in bottles. It starts at a temperature of 115° and is stepped up to 148° for 6 minutes, resulting in a total time of 15 minutes at 145° or above. Milk treated by this method keeps sweet for relatively long periods and is especially suitable for use in homes without refrigeration, but the milk has a cooked flavor.

Comments, Section III, Subject 2

The 5 papers that were submitted for discussion under Subject 2, Mechanization of Cheesemaking, were reviewed by the general reporter, Prof. K. Zeiler, of Germany. Dr. E. Capstick, of Great Britain, and G. Mocquot, of France, opened the discussion. Dr. R. E. Hodgson and L. S. Olsen were assigned to represent the United States delegation at this

session.

It was apparent that workers in different countries differed considerably regarding the advantages of mechanization of cheesemaking. The extent to which cheesemaking can and will be mechanized depends on the supply and cost of labor and on the shift from farm to factory manufacture.

In the Netherlands, according to F. T. Heestra, there has been a gradual shift in the last 4 decades from making cheese on the farm to factory manufacture, until now factories account for more than 80 percent of the annual production. The shift from farm to factory manufacture has been even greater in Great Britain, Australia, New Zealand, the Scandinavian countries, and the United States. On the other hand, in Belgium, France, and Switzerland, most of the cheese is still made on farms. Specialists in these countries apparently still feel that it is not possible to make the desired special types and brands on a large scale in mechanized factories.

It was brought out that the manufacture of cheese is much less mechanized than the manufacture of any other dairy product. This is partly because of variation in the methods used in making the many different kinds of cheese and lack of suitable equipment, and also because through the years cheesemaking has been considered an art rather than a science. Development of better methods of holding milk in good condition on the farms and of improved methods and equipment for transporting milk to the factory favors the trend toward factory manufacture and mechanization.

One paper described the Steinecker cheesemaking machine (Zeiler-Lenz system), that was developed in Germany. The machine can be equipped with various devices so that most of the common varieties of hard or soft cheeses can be made. Most of the hand labor is eliminated, the temperature and acidity are carefully controlled throughout the making process, the cheese is of uniformly high quality, and the yield is higher. Dr. N. S. Golding, of the United States, contended that cheesemaking in the United States must become more fully mechanized if cheese is to compete favorably with other products. In this connection, a new short-time method for making Cheddar cheese, recently developed by the United States Bureau of Dairy Industry, holds much interest. The new method requires only 2½ hours from the time the rennet is added to the milk until the curd is pressed, and most of the hand labor required in present methods is eliminated.

Comments, Section III, Subject 3

The 15 papers that were submitted for discussion under Subject 3, Construction of Dairy Equipment (With a View to Cleanliness); and Efficacy of Cleaning Methods, were reviewed by the general reporters, Prof. W. Mohr and Prof. K. Plock, of Germany. J. Pien, of France, and Dr. G. M. Trout of the United States, opened the discussion. Dr. E. L. Jack and Dr. G. M. Trout were assigned to represent the United States delegation at this session.

The papers covered a considerable range of interest on the broad subject of dairy equipment, including the problems of cleaning such equipment, the efficacy of various methods of cleaning and sterilizing, and the use of different cleaning agents. Prof. Mohr made a strong recommendation that manufacturers of dairy equipment, in developing new equipment and utensils, give even more attention than they have in the past to the ease of effective cleaning and sterilization.

Effective cleaning followed by complete sterilizing of all equipment and utensils is a daily requisite in the production of high-quality milk and milk products. Cleaning and sterilizing agents must be low in cost, be capable of doing an effective job, and be easy and safe to use. There is need for constant and thorough bacteriological checking of the cleaning methods in milk plants.

It was pointed out that there is still need for more thorough education of farmers and plant workers on the necessity for sanitation in handling milk and milk products. Manufacturers of cleaning and sterilizing agents can do much to aid in this educational work. It was apparent that the European dairy industries depend more on hot water and steam than on chemical agents for sterilizing dairy equipment; and the reverse is true in the United States.

Comments, Section III, Subject 4

The 12 papers that were submitted for discussion under Subject 4, Economy in the Use of Heat, Power, and Labor in the Dairy Industry, were reviewed by the general reporter, Dr. H. Rautavaara, of Finland. The discussion was opened by H. Jensen, of Denmark, and W. W. Ritchie, of Great Britain. Dr. C. W. England, A. C. Ragsdale, T. Kline Hamilton, L. S. Olsen, and J. C. Norgaard were assigned to represent the United States delegation at this session.

Dr. Rautavaara pointed out that heat, power, and labor constitute the major cost items in processing milk and manufacturing milk products. These cost items are an important reason for the trend throughout Europe to larger factory units, as the size of the operation is a determining factor in the cost per unit of product.

Increasing power consumption in factories has been accompanied by a significant reduction in human labor.

Seasonal variation in the production of milk is one problem. The factory must be equipped to take care of the milk produced in the season of maximum production. This results in inefficient use of power, heat, and labor during the period of minimum production. Dr. Rautavaara called attention to the possibility of reducing costs by reducing losses of heat and power that occur in many dairy plants.

Mr. Jensen reported on a study that showed cost of heat and power are directly proportional to the number of cheeses made in an Emmenthaler factory.

Mr. Ritchie called attention to the fact that the cost of power is too often overlooked when new installations are made.

J. Campbell, of Sweden, described a new Swedish drier that is now available. If the drier proves as effective in practical use as in experimental tests, it will save 15 percent of the drying costs.

It was suggested that use of compressed air could be increased frequently to good advantage.

It was brought out, also, that work done at experiment stations frequently is too theoretical and is not always economical to follow in practice.

Comments, Section III, Subject 5

The 8 papers that were submitted for discussion under Subject 5, Problems of Waste Water in the Dairy Industry, were reviewed by the general reporter, Prof. J. Keilling, of France. J. H. A. Schaafsma, of

the Netherlands, and Dr. Schulz-Falkenhain, of Germany, opened the discussion. Col. B. F. Castle and Dr. H. D. Weihe were assigned to represent the United States delegation at this session.

In his review, Prof. Keilling said that the disposal of dairy waste water is one of the greatest problems confronting the dairy industry, because of the cost involved.

Dairy waste water varies greatly in composition, mainly because of variation in the amount of wash water it contains. It is characterized by the presence of lactose, lactic acid, and protein. The problem of disposal can be minimized somewhat by reducing losses of milk in the plant and by recovering the milk solids from the waste before disposal. Purification of the waste water before disposal is another way of meeting the problem, but this is a costly procedure at present. Purification can be effected either by destruction of the organic matter in the waste or by recovery of the organic matter for industrial purposes.

In his discussion, Col. Castle said the problem of disposal of dairy waste water is becoming increasingly troublesome in the United States because of the public's desire to reduce stream pollution. Both the dairy industry and Government research agencies are giving the problem a great deal of attention. He was interested to learn that in some countries dairy waste water is sprayed on farm land, such as land used for growing sugar beets, and in some instances dairy pastures. He felt that more attention should be given to finding ways and means of utilizing dairy waste water to create salable byproducts. As an example, he cited a paper plant in West Virginia that found that the waste from its factory, which had been polluting a nearby stream, could be dried and sold for commercial purposes. He wondered if it would be practical to spray-dry dairy-plant waste water. Would the resultant dry milk (adulterated) be salable for feed, and thus return the cost of the drier and its operation.

Progress toward solution of the problem of disposing of dairy waste water was indicated by the section chairman, Dr. Keilling, in his closing remarks, when he said, "I hope that at the Congress in 1956 we shall hear that practical solutions of this problem have been effected."

SECTION IV.- FUNDAMENTAL RESEARCH

Prof. P. Kästli, of Switzerland, was chairman of the sessions under Section IV, and Dr. A. T. R. Mattick, of Great Britain, and Dr. O. F. Hunziker, of the United States, were vice-chairmen.

Ninety-one papers (5 reports, 71 contributions, and 15 communications) were submitted under Section IV, Fundamental Research. The subject matter was presented under 5 subjects, as follows:

Subject 1.- Changes which milk undergoes as a result of heating.
Subject 2.- Oxidation defects of milk and dairy products.
Subject 3.- (a) Symbiotics, antibiotics; (b) Bacteriophages.
Subject 4.- Methods of analysis.
Subject 5.- The nutritive value of milk and dairy products.

Comments, Section IV, Subject 1

The 6 papers that were submitted for discussion under Subject 1, Changes which Milk Undergoes as a Result of Heating, were reviewed by the general reporter, Prof. G. Sjöström, of Sweden. Prof. George T. Pyne, of Ireland, and H. Hendricks, of Belgium, opened the discussion.

Dr. E. L. Jack, Dr. F. E. Rice, and Dr. H. D. Weihe were assigned to represent the United States delegation at this session.

The importance of fundamental research in this field (changes in milk as a result of heating) is of great interest to the dairy industry because milk is heated to some degree in almost every processing operation. The reporter considered the subject from the standpoint of the effects, both physical and chemical, on the milk fat, the proteins, the enzymes, the lactose, the vitamins, and the salt balance. These effects are closely interrelated and center around the stability of the milk proteins to heat.

Delegates from Germany, Switzerland, the Netherlands, England, and Denmark joined in the discussion, presenting various viewpoints and clarifying certain issues. Much of the discussion was concerned with the influence of different factors on protein stability. It was emphasized that a satisfactory test for protein stability would advance technological progress materially. Such a test would show the effects to be expected from different degrees of heating in any given lot of milk.

The reports pointed clearly to the tendency in commercial practice of using higher temperatures for shorter periods of time, to minimize the adverse effects of heat. Fundamental research provides a basis for such advancements.

A processing method called "Uperization," recently developed in Switzerland, was referred to in the report. The process consists of heating milk by steam injection, followed by instant cooling in vacuum. The milk is then packaged by aseptic techniques. The individual processes have been in use for some time but perhaps have not been combined into a single operation previously.

Comments, Section IV, Subject 2

The 9 papers that were submitted for discussion under Subject 2, Oxidation Defects of Milk and Dairy Products, were reviewed by the general reporter, Dr. C. H. Lea, of Great Britain. Dr. W. Ritter, of Switzerland, and E. G. Pont, of Australia, opened the discussion. Dr. C. W. England, Dr. E. L. Jack, Dr. F. E. Rice, and Dr. H. D. Weihe were assigned to represent the United States delegation at this session.

The importance of this subject to the dairy industry is indicated by the fact that in spite of many years of competent investigation the development of oxidized flavors in many of our dairy foods is still one of the most troublesome problems. The importance of the subject is further emphasized by the fact that competing food fats, because of the processing treatments they undergo and because antioxidant additives are permitted in them, do not exhibit this defect to nearly the same extent as milk fat.

In his review, Dr. Lea covered the subject most completely and in an authoritative manner. He summarized the status of our knowledge in this field of investigation and presented evidence for and against the different viewpoints concerning the mechanism of oxidative changes as well as the major constituents involved. It is apparent that the chemical changes are very complex and not well understood. If defects are to be prevented, aggressive research must be continued. Dr. Lea cited several key experiments that need to be performed in order to advance our knowledge on this subject.

A delegate from Germany joined in the discussion; however, discussion from the floor was limited, perhaps because Dr. Lea had reviewed the

subject so completely and perhaps also because the subject is so complex that it does not lend itself well to extemporaneous comments.

The point was emphasized that with our present knowledge of antioxidant additives it would be possible to prevent the development of oxidized flavors in milk fat, but their use is restricted by regulatory agencies. The Netherlands has developed a good antioxidant for butter, and several harmless or even wholesome antioxidants that will retard the development of an oxidized flavor in milk are available. England is liberalizing its restrictions on the use of antioxidants in certain foods, and it was implied that this modification of restrictions should be extended to dairy foods.

Comments, Section IV, Subject 3

The 20 papers that were submitted for discussion under Subject 3, (a) Symbiotics, Antibiotics; and (b) Bacteriophages, were reviewed by the general reporter, Dr. A. T. R. Mattick, of Great Britain. A. J. Overby, of Denmark, and Prof. P. Simonart, of Belgium, opened the discussion. Dr. E. L. Jack, Dr. G. M. Trout, and Dr. H. D. Weihe were assigned to represent the United States delegation at this session, which was of special interest to the cheesemaker and to the processor of fermented beverages, such as cultured buttermilk and yoghurt.

The general use of antibiotics for the treatment of bovine mastitis has resulted in some difficulties when the milk from treated cows is made into such products as cheese or fermented beverages. Dr. Mattick dealt with the action of antibiotics from two standpoints: (1) Impairment of lactic fermentation in the milk from treated cows; and (2) the use of specific antibiotics to restrict the growth of undesirable organisms in milk.

It is Dr. Mattick's opinion that work on bacteriophages requires more fundamental study before methods can be adopted to overcome difficulties caused by phage action.

The use of nisin-type antibiotics to suppress gas-producing organisms is of particular interest. Additional studies along this line should be undertaken.

Research work indicates that the effect of penicillin can be counteracted in milk by the use of the enzyme penicillinase, but more work is needed on this subject. There seems to be no effective way as yet of neutralizing the activity of other antibiotics.

Comments, Section IV, Subject 4

The 32 papers that were submitted for discussion under Subject 4, Methods of Analysis, were reviewed by the general reporter, Dr. C. I. Kruisheer, of the Netherlands. Dr. H. Hostettler, of Switzerland, and Prof. G. Schwarz, of Germany, opened the discussion. Dr. E. L. Jack, Dr. C. W. England, Dr. G. M. Trout, and Dr. H. D. Weihe were assigned to represent the United States delegation at this session.

The development of analytical methods is needed for expansion of both fundamental research and technology in the dairy industry. The development in recent years of electronic instruments, used particularly for photoelectric colorimetry, chromatography, and light absorption, has resulted in important advances in this field. The discussions on paper chromatography and paper electrophoresis were of particular interest. The chromatography technique has been especially valuable in studying the amino acids in cheese. It has been useful also in

studying the relationship of fermentation in cheese ripening to the characteristic flavors of certain cheeses and in studying the volatile fatty acids in cheese.

The discussion centered about the following points:

(1) Determination of the moisture content of dairy products. It was pointed out that different results are obtained with different methods of analysis, because water may exist as bound water, free water, and water of crystallization. This is of considerable importance in determining the total solids in plain condensed milk, because over 50 percent of the total solids is lactose and 5 percent of the lactose can be water. It was suggested that methods of determining moisture be standardized so that uniform results might be obtained.

(2) Methods for determining "starter activity." Various tests were discussed. It was pointed out that a test requiring less time than those now used is desired. Dr. N. S. Golding, of the United States, advised that the modified rennet test is quite satisfactory when a 10-percent low-heat powder (10 parts of powder plus 90 parts of water) is used.

(3) A colorimetric method for determining the amount of reconstituted milk in normal milk was described.

(4) An improved method for determining the amount of sediment and scorched particles in milk powder was described.

(5) Micromethods for determining trace elements, such as copper, iron, and cobalt, in milk and milk products. These trace elements have an important effect on deterioration of milk flavor.

Comments, Section IV, Subject 5

The 9 papers that were submitted for discussion under Subject 5, The Nutritive Value of Milk and Dairy Products, were reviewed by the reporter, Mrs. L. Randoin, of France. Dr. S. Y. Thompson, of Great Britain, and Prof. E. Brouwer, of the Netherlands, opened the discussion. Dr. E. L. Jack, Milton Hult, A. C. Ragsdale, and Dr. R. E. Hodgson were assigned to represent the United States delegation at this session.

Mrs. Randoin pointed out that knowledge concerning the nutritive value of milk and its products and technical progress in the dairy industry should go hand in hand. Many factors cause changes in the nutritive value of milk. The cow's feed affects the nutritive value of its milk, and the treatment the milk undergoes in preparing it for market and in manufacturing various dairy products also affects the nutritive value of the milk or the product. Much more is known of the nutritive value of milk as it is drawn from the udder than is known of the effect on nutritive value of the processing treatment the milk undergoes in preparing it for market or in manufacturing dairy products, or in the use by the human body of the valuable constituents of milk and dairy products. Additional research should be undertaken to develop our knowledge in these latter fields.

The vitamin A potency of Dutch and New Zealand butter has been found to average from about 14,000 to 16,000 international units per pound, which is about the same as American butter. Also, it was found that the vitamin A potency of the butter is higher in summer (when the cows are on pasture) than in winter (when they are barn-fed).

The cholesterol content of Dutch milk and butter was found to be 0.0115 percent and 0.264 percent, respectively. There is very little seasonal variation in the cholesterol content of Dutch milk.

Prof. E. Carbone, of Italy, reported that milk produced in the Po Valley over the past 50 years has shown a gradual decrease in fat and solids-not-fat.

The use of chemical additives in dairy products, as related to their nutritive value, was discussed. It was suggested that such chemicals could be used if they do not impair health and if they are technologically indicated and organoleptically acceptable. In the interest of international trade, uniform regulations should be adopted for the use of chemical additives.

SECTION V.- ECONOMICS

Waldemar Ljung, of Sweden, was chairman of the sessions under Section V; and Dr. Karl Aug. Wegner, of Germany, and Raymond Guerault, of France, were vice-chairmen.

Thirty-seven papers (5 reports, 28 contributions, and 4 communications) were submitted under Section V, Economics. The subject matter was presented under 5 subjects, as follows:

Subject 1.- Expenditure on milk and dairy products in the household budget.

Subject 2.- Effect of the natural variation in milk yield, including composition of the milk, upon the cost price of products manufactured from milk.

Subject 3.- Supplying milk to large centers of population.

Subject 4.- Information and publicity; packaging and sales methods.

Subject 5.- Transportation and storage (in connection with export to hot countries and fluctuations in output).

Comments, Section V, Subject 1

The 2 papers that were submitted for discussion under Subject 1, Expenditure on Milk and Dairy Products in the Household Budget, provided some interesting comparisons. They were reviewed by the general reporters, M. Compton and J. L. Davies, of Great Britain. Milton Hult, of the United States, and Prof. E. Zollikofer, of Switzerland, opened the discussion. Dr. H. E. Trelogan and Col. B. F. Castle represented the United States delegation at this session, in addition to Mr. Hult.

One of the papers on this subject was based on a food survey in the United Kingdom (England, Scotland, Wales, and Northern Ireland), which probably provides the best source of detailed data to be found in any major country on food consumption for all groups of people and all kinds of food. The other paper reported on consumption of milk and dairy products in Switzerland, where average per capita consumption is relatively high as compared with other countries. For example, per capita consumption of milk is 200 percent higher in Switzerland than in the United Kingdom, and per capita consumption of cheese is 150 percent higher.

According to the British survey, consumption of fluid milk has increased 60 percent and consumption of milk solids other than butter has increased 24 percent since before the war (1938). However, housewives still spend much less on milk and milk products than on meat and meat products, the traditional British source of animal protein. In Switzerland, this pattern of expenditure is reversed.

Differences in per capita consumption of fluid milk between social (income) groups in the United Kingdom are less than before the war, principally because under food rationing per capita consumption by the middle income group has nearly doubled and by the lowest income group

has nearly trebled. The differences that still persist are due partly to habit and taste preference and partly to differences in purchasing power.

In Switzerland, on the other hand, per capita consumption of fluid milk is greatest in the lowest-income group, and groups with higher incomes consume less fluid milk but more butter. All groups consume about the same amount of cheese, but those with higher incomes buy more expensive cheeses. In both countries, milk consumption is greater in rural than in urban areas.

The British survey showed that expenditures for milk and milk products are affected more by size of household than by income. About 17 percent of the total expenditure for food was spent for milk and milk products by all groups. However, childless households spent more per capita than households with children, with most of the difference due to expenditures for fluid milk. Evidence indicates that demand is not affected by small price changes once the pattern has been established. Patterns of consumption of 1950 are persisting for dairy products other than butter despite rising prices. However, families with several children may be affected by further price rises.

Mr. Hult opened the discussion with an outstanding description of recent changes in the United States, featuring the program, objectives, and methods of the National Dairy Council. The latter evoked considerable interest among the participants.

Professor Zollikofer continued the discussion with an excellent explanation for the rather unusual consumption pattern found in Switzerland. In some instances, dairies boil the milk and sell it ready for consumption. However, most of the milk is produced on farms close to the towns, and consumers go directly to the farm for it. The milk is relatively cheap, as there is no cost for transportation, pasteurization, bottling, or delivery. In more than 90 percent of the households, the milk is boiled and consumed hot with meals. Evidently, the milk is obtained from farms and "cooked" along with the rest of the meal. The hygienic factors are all covered by this heating.

These circumstances explain why pasteurization has developed more slowly in Switzerland than in some other countries. Sale of pasteurized milk in bottles in areas where it has been introduced has lowered the per capita consumption of milk. Pasteurized milk is 10 percent more expensive than raw milk and consumption is reduced by about 10 percent.

Comments, Section V, Subject 2

The 5 papers that were submitted for discussion under Subject 2, Effect of the Natural Variation in Milk Yield, Including Composition of the Milk, Upon the Cost Price of Products Manufactured from Milk, were reviewed by the general reporter, Prof. E. Esche, of Germany. P. Stallinga, of the Netherlands, and Prof. A. Guerault, of France, opened the discussion. Dr. H. C. Trelogan, Dr. E. L. Jack, and Dr. C. W. England were assigned to represent the United States delegation at this session.

Professor Esche introduced this topic by observing that we should have free enterprise and pricing so that costs and returns would determine disposition of milk, but such is not the case because prices are regulated. However, consideration must be given to seasonality of production, cost of feed, and the plant's responsibility for taking all the milk all the time. Variations in the composition of milk are important from the standpoint of cost and also disposition.

Some milk in Germany, as well as in other countries, is not bought on a fat basis. Prices are calculated on the basis of supplies. In any event a dairy can pay only the income less the costs.

Payments made by dairies for milk supplies of varying composition should be computed on the basis of their net utilization value. What is important in any case is that the milk be paid for by its content of butterfat. Another point is that skim milk purchased by suppliers from their dairy or by the dairy from its suppliers be correctly assessed, so as to direct its utilization into the most profitable channels. This is a problem comparatively easy to solve by the simple application of marginal calculation, a method that eliminates the difficulty of apportioning costs of coupled products to the various sub-products.

In contrast to this it is not possible with any certainty to apportion the net utilization value of the milk supplied to the quantities of butterfat and of nonfat solids it contains. This being the case, an American method of payment for milk supplied is worth considering, because it dispenses with the apportioning altogether, starting from a price which varies with the average net utilization value of the milk supplied to the dairies. For cases of milk of fat content deviating from the average, price corrections are provided, the calculation of which is based on the assumption supported by analyses, that certain correlations exist between the fat content and the content of nonfat solids. In this task too, the application of marginal calculation suggests itself. If the free movement of market prices is impeded, special measures are necessary, lest the incentive to adapt production to demand be lost.

In opening the discussion, Mr. Stallinga agreed that the price of milk should not be uniform throughout the year but cautioned against altering the cost too fast or arbitrarily and cited a number of considerations that should be taken into account, especially from the farm cost point of view.

Prof. Guerault gave greater emphasis to the plant considerations, citing the economies of scale up to an optimum point. Using illustrations from cheese factories, he indicated formulas being tried to ascertain prices on the basis of protein factors and fat content along with a protein coefficient.

The discussion revealed that no universally satisfactory methods were recognized. The American proposal (evidently that of Hardin and Froker) seemed attractive but was criticized on the basis that it did not allow sufficiently for individual cow differences in the relationship between fat and solids-not-fat content.

Interest in a seasonal pricing system varies between producers and factories. Plants seek to level out production to lower their costs resulting from unutilized capacity, but this adds to the cost of the producer.

Comments, Section V, Subject 3

The 12 papers that were submitted for discussion under Subject 3, Supplying Milk to Large Centers of Population, were reviewed by the general reporter, G. Breart, of France. F. Procter, of Great Britain, and A. List, of Austria, opened the discussion. Col. B. F. Castle, T. Kline Hamilton, and A. C. Ragsdale were assigned to represent the United States delegation at this session.

The papers on this subject, and the discussion from the floor, dealt largely with a description of the organizations and methods employed for supplying milk to the people in the large cities of western Europe, southern Europe, and India. It is apparent that the market-milk

distribution programs of cities in these areas have not yet reached the degree of perfection or specialization of the market-milk distribution programs of cities in the United States. However, movement toward improvement and development is in the same direction as that taken in the United States. Apparently there is much greater government control and supervision of the market-milk industries in these areas than in the United States. Technical progress is being made, and this will account for expanded public acceptance of and increased demand for market milk. Pasteurization and sterilization of milk is emphasized.

Comments, Section V, Subject 4

The 12 papers that were submitted for discussion under Subject 4, Information and Publicity; Packaging and Sales Methods, were reviewed by the general reporter, J. Sundby, of Norway. G. P. Gundlach, of the United States, and S. Matallana, of Spain, opened the discussion. Milton Hult, T. Kline Hamilton, and Dr. H. C. Trelogan were assigned to represent the United States delegation at this session.

Professor Sundby gave considerable attention to the advantages to the dairy industry and to the consuming public of aggressive industry informational and publicity programs to acquaint the people with the high nutritional value of milk and milk products. The programs to be most effective must be truthful and in simple, effective terms.

Professor Sundby outlined a suggested program for consideration by countries interested in increasing their informational and publicity programs, and he stressed the advisability of working through schools.

A fuller exchange of scientific information among nations is needed. The British Dairy Science Abstracts are helping in this regard. The need for added research on the nutritional value of milk, in order to develop greater knowledge of the total contribution dairy foods can make toward the nutritional welfare of the people, was stressed. But industry was urged to use to a greater extent the information it now has in its efforts to acquaint consumers throughout the world with the nutritive value of dairy foods.

Educational programs must be accompanied by a readily available supply of high-quality dairy foods, in packages that appeal to the consumer and that are easy to use in the home. Papers from several countries reported progress in efforts to develop better consumer-type packages for cheese, butter, and dry milk.

In his discussion, Mr. Gundlach stressed the influence of various factors, such as improved transportation, development of new and improved products, and development and use of refrigeration on the increased consumption of dairy foods in America.

According to Professor Sundby, educational programs should stress only the nutritional value of dairy foods. However, Col. B. F. Castle, of the United States, said that educational programs should emphasize also the comparative economy of dairy foods, at least in the United States where a change in the price of milk is front-page news.

Comments, Section V, Subject 5

The 4 papers that were submitted for discussion under Subject 5, Transportation and Storage (In Connection with Export to Hot Countries and Fluctuations in Output) were reviewed by the general reporter, Dr. D. H. Khurody, of India. P. Okkinga, of the Netherlands, and Dr. R. E.

Hodgson, of the United States, opened the discussion. L. S. Olsen was assigned to represent the United States delegation at this session, in addition to Dr. Hodgson.

This session was held immediately following the general lecture by Dr. Khurody on Milk and Milk Products in Tropical Countries (page 32) and his lecture largely formed the basis for the discussion.

Dr. Khurody reviewed the problems confronting the dairy industry in the Far East and described the steps that governmental agencies are taking to increase the local supply of milk and to improve its quality. The chairman asked Sir Data Singh, of India, to speak on this subject, and he reviewed briefly the all-India cattle improvement program now being undertaken. He dwelt on the problems arising from the surplus of nonproductive cattle and how the government is meeting them by localizing the cattle on ranges away from centers of heavy population. He mentioned also the educational and research programs being initiated.

In his discussion, Dr. Hodgson reviewed steps available for improvement in the production, transportation, processing, and marketing of milk produced locally in tropical countries. These included improvement in breeding, feeding, and management of cattle, and improvement in organized processing and marketing of the local milk supply. When local supplies are inadequate, they can be supplemented by imports, preferably evaporated, condensed, sterilized, and dehydrated milk.

GENERAL LECTURE I.- THE UDDER AND HOW IT FUNCTIONS--SOME MODERN VIEWS

The purpose of this general lecture by Dr. H. D. Kay, Director of the National Institute for Research in Dairying, Reading, England, was to give the Congress participants an up-to-date review of the latest developments contributing to our knowledge of milk secretion. It was also for the purpose of stimulating in the International Dairy Federation a greater interest in the dairy farming or production phases of the dairy industry. Dr. Kay brought out that the nutrients which the udder glands synthesize into milk are brought there by the circulatory system from the feed nutrient supply digested and assimilated by the animal. The role of the endocrine system in the growth of the udder duct system and secretory tissue, and in the initiation of lactation and the letdown of milk at milking time was demonstrated. He reviewed the newly developed techniques such as the perfusion of the freshly amputated udder.

The problems concerned with the use of thyroprotein (synthetic thyroxin) as a galactogog were discussed from the standpoint of its practical application and the limited usefulness of this material in commercial dairying. The changes in the mammary gland, including the reduction of the size and number of alveoli cells (secretory cells) with advance in lactation period, were illustrated. The lecturer also dwelt on the significance of the changes in the composition of milk, especially the amount of milk fat and solids-not-fat, and the relation of these changes to the feeding and management of the cow and to the utilization of milk in processing plants.

GENERAL LECTURE II.- THE MILK INDUSTRY AND THE MILKING MACHINE

In this general lecture, Prof. J. Keilling of the National Institute of Agriculture, Paris, France, pointed out the advantages and disadvantages of the use of milking machines to the farmers and to the milk-processing organizations. The cost of milking machines limits their use

to larger size herds. Work should be done to adapt machines to small farm operations. Machine milking saves considerable labor.

On the other hand, unless the milking machine is used properly it can cause changes in the quality of milk and udder infections in cows. The importance of proper use and thorough cleansing and sterilization of the milking machine parts that come in contact with the cow and the milk is of utmost importance if the milking machine is to be successful. To this end the manufacturers of milking machines, the dairy plant operators, and educational groups--all must lend a hand in educating the farmer in the use of the milking machine. The questionable use of the machine, he felt, was more concerned with milk used for cheesemaking than for other uses. The questioning of the use of the milking machine seemed strange to the United States delegation, since more than 540,000 milking machine units are in use on farms in the United States.

It would seem that in the educational efforts of the people in Europe to get farmers to use milking machines properly they could resort to the American program that was so effectively put across to our farmers during World War II. This program stressed the rapid-milking technique, which includes proper care and use of the machine, proper conditioning of the udder and of the cow for milking, and proper milking.

GENERAL LECTURE III.- THE ECONOMICS OF THE DAIRY INDUSTRY

This general lecture, which was listed also as "Problems of Operating Economy in the Dairy Industry," was a discussion of cost accounting methods for dairy plants, by A. Hilding, of Sweden. The subject was divided into 3 parts, as follows:

1. Introduction, defining the problems.
2. Account of the work of the study group of the International Dairy Federation.
3. Account of the structure of operating statistics in Scandinavian countries.

1. Introduction, defining the problems.- During the past few decades the dairy industry has tended to grow into large enterprises, often engaged in many-sided production. This development has placed obstacles in the way of economic supervision or control of technical results and costs. It would seem to be of urgent importance that the dairies generally should accept such a method of accounting for costs and technical results as will afford a clear idea of the costs and consumption of raw materials involved in the various dairy processes. A continuous cost-place bookkeeping system renders possible a thorough check on costs.

2. The International Dairy Federation's study group dealing with operational economy.- The task of this group is to investigate and recommend suitable methods of estimating the results of the dairies' productive activities.

The group work has been divided in the following way: Processing efficiency and its appraisal; costs efficiency; and the control of costs in connection with the collection and distribution of milk. The possibilities are being examined of drawing international comparisons of efficiency in the field of dairy operating.

3. Some methods of and trials for carrying out costs control and costs appraisal on a large scale in Scandinavian countries.- For the past 50 years the dairy organizations in Denmark and Finland have on the basis of the dairies' account books investigated and published annually the associated dairies' main operating results.

The Swedish operating statistics are based on the dairies' commercial

bookkeeping. The trend in Sweden, however, towards ever larger dairies, with varied utilization of the milk, makes the assessment of costs extremely difficult.

In Norwegian dairies the method used is that of direct observations of the use of labor, fuel, power, plant, essential equipment, etc., in order to arrive at normal standards of costs. Experiments in cost-place accounting have been proceeding in about 40 Swedish dairies. This system of cost accounting has consisted in dividing the accounts into different cost places and products. Each dairy receives a report showing the kind of costs distributed over main departments and subsidiary departments.

It is evident that an account of the costs for the places within the dairy does not only help the management to get a clearer survey of the costs development and their causes but also creates possibilities of making direct comparisons with the corresponding departmental costs of other dairies.

Mr. Hilding emphasized the uses that could be made of uniform cost accounting among dairies citing such points as: Larger plants and higher costs of milk lays increasing stress on accounting for managers. It helps cope with the problem of allocating costs between products. It is important for calculating prices although with dairy prices subject to so much regulation this use may be confined to negotiating fixed prices. It enables cost of subsidiary departments or service to be apportioned proportionately. Mr. Hilding did not, however, discuss the principles that might apply to such apportionment of costs or prices.

Cooperatives need it for compensating producers. Other plant management needs it for judging efficiency. Technical efficiency does not guarantee economic efficiency he pointed out. The system must not cost too much especially for small plants. A uniform system such as that being developed by a subcommittee of the IDF can be used by managers to compare their relative efficiency with other plants. This requires uniform measures such as the classification of fixed and variable costs.

GENERAL LECTURE IV.- THE FUTURE OF BUTTER

"No one knows what the day may bring until the sun has set," said Prof. L. P. Frederiksen, of Denmark, before he presented a very optimistic paper on the potentialities for regaining butter markets. His statement was clearly designed to be an antidote for the gloom incurred by the decline in butter consumption apparent in virtually every country. Although 95 percent of the exports of butter come from 5 countries and 71 percent of the imports go to Great Britain, interest in the problem is world-wide. Moreover, the almost universal increase in consumption of other dairy products is not enough to offset the decline in butter in the U. S. and Great Britain, two traditionally high butter consuming countries.

The paper surveys the position of butter production in relation to international dairying. It must be acknowledged that the situation presents several dark points because the importance of butter production, quantitatively and economically, has been declining over a considerable period while the production of other fats, especially margarine, has increased enormously. The explanation of this lamentable development must be sought, for the most part, in the abnormal circumstances following two world wars. This gives reason to hope that the difficulties are, in some degree, of a temporary character and that the situation will improve gradually as the abnormal conditions are replaced by peaceful conditions and the building up of international cooperation to achieve a higher standard of living. To promote and to stabilize such a development, the

dairy industry must take a positive and an active part in reconstruction work by using modern technical knowledge and equipment to the greatest possible extent. Efforts must in the first place be directed to the improvement of butter quality and to the reduction of production costs; secondly an active information service and an effective sales propaganda policy must be established, employing all available means to increase the use of butter. When that is done there will be some hope that butter production may again take its traditional place as one of the most important factors in the dairying industry.

It is possible to assist progress on these lines by cooperation between the dairy industries in the different butter-producing countries, irrespective of frontiers, and it will naturally be the task of the International Dairy Federation to place itself at the disposal of all and to gather together the forces that will work together to this end.

If we take up this work skillfully, energetically, and with farsightedness there are grounds for believing that the object will be achieved so that we can look forward optimistically to a bright future for butter and butter production.

Prof. Frederiksen was confident butter has superiority that science should reveal. He also felt that political interests that have favored other fats could be altered and inferred that freedom from regulation, at least some types of regulation, would help. He chose to review the situation in the light of postwar, and he hoped, temporary conditions. He chose to hope for greater freedom in production and marketing, to urge industry promotional activity and to believe that butter can reassume its important place.

GENERAL LECTURE V.- MILK AND MILK PRODUCTS IN TROPICAL COUNTRIES

Dr. D. N. Khurody, the Government of Bombay, India, very ably discussed this important subject with the aid of an excellent movie film before a well-attended general assembly of the Congress. He treated the subject in several parts: (1) The general dairy situation in the tropical world, particularly India, Pakistan, and Burma; (2) the need for increased supplies of dairy products; (3) approaches to improving production and uses of milk and its products in the tropics; and (4) the importation of dairy products to supplement the local supply.

Commenting on the first point, Dr. Khurody said that tropical countries cover about one-third of the world's land area, they have about one-third of the world's cattle population, and they contain about one-fifth of the world's human race. Both the cow and the water buffalo are used for milk production. The cow, being sacred in some localities because of religion, is not destroyed but is maintained until natural death. This puts a heavy burden on the nation's feed supplies. Milk production per animal is extremely low because of the short, irregular natural feed supplies, the lack of progressive improvement programs, and the inability to control breeding. In addition, the methods used in marketing and utilizing the milk produced are inefficient due to lack of transportation, refrigeration, equipment, and technical competence.

In commenting on point 2, he pointed out that per capita consumption of milk in these Far Eastern areas is less than 6 ounces daily. Consumption is irregular because of the great seasonal variation in milk production, which drops in summer to below 50 percent of the winter production. Consumption can be increased by bringing about more efficient methods of marketing which will utilize more of the milk that is produced.

The opportunities for increasing milk production in tropical countries

are unlimited according to the speaker. He dwelt on the difficult problems of keeping cows in dairies in large cities such as Bombay. A description was given and this was supported by moving pictures showing how responsible officials under Dr. Khurody's leadership had developed a large modern dairy colony some distance out of Bombay. The cattle that once were housed in Bombay were sent out to the colony, where they receive good feeding and management and as a result milk production and the quality of milk has greatly improved.

Dr. Khurody discussed the importance of supplementary local supplies of milk with imports from surplus producing countries. He raised the question as to whether dry whole or dry skim milk could be put up and packaged in wafer-like cakes for use by workmen and school children as part of their noon meal. He indicated the consumers in tropical countries are learning to appreciate and use dry, concentrated, and sterilized milks efficiently in their daily diets.

Dr. Khurody's lecture was undoubtedly the outstanding lecture of the Congress as measured by the interest and long applause when he concluded. Several of the Congress presiding officers alluded to it during the sessions. Dr. H. D. Kay of Great Britain, chairman of the International Dairy Federation Commission on Studies, and the presiding officer of the session at which Dr. Khurody spoke, at the conclusion of this lecture restated that the International Dairy Federation considered problems of tropical dairying of such great importance that a special commission was being established to work on tropical dairy problems.

CLOSING OF THE CONGRESS

The final session of the Congress was held in the Kurhaus Hotel at 3 p.m., on Friday, June 26. Dr. Homan, President of the Congress, presided.

Dr. Homan presented 5 statements which, in the opinion of the Commission of Studies of the International Dairy Federation, were the important matters brought out in the Congress deliberations. The statements follow:

STATEMENT I

In the opinion of the Congress:

(A) A general improvement in milk quality, i.e., in nutritional quality, in hygienic quality, in its ability to withstand deterioration, and in its suitability for the manufacture of milk products of high quality, is still one of the most important objectives of dairy science and technology;

(B) To achieve this improvement, the obvious need (and possibly the only way for its accomplishment) is to compensate in a higher price for producers of milk, for the higher costs of production which these requirements entail;

(C) An investigation and a subsequent clear statement should be made (1) of the requirements as to quality which milk should fulfill in the future, having regard to the different uses to which it is to be put (2), of how these qualities should be related to the price of the milk.

The following are among the points that should require consideration:

1. Flavor
2. Chemical composition (fat, non-fat solids, proteins, vitamins, enzymes, chemical stability, presence of agents inhibitory to the bacterial growth)
3. Bacteriological quality - absence of disease producing organisms or organisms likely to cause defects - and presence of bacteria needed for the making of special quality products.

STATEMENT II

In the opinion of the Congress:

(A) An increase or even the maintenance of the consumption of milk and dairy products depends not only on the general realization among consumers of their outstanding nutritional value, but perhaps even more on securing higher standard of organoleptic qualities;

(B) Therefore, in addition to the attention paid to the compositional and hygienic quality and the absence of defects, even more attention must be paid in the future to the more positive gustatory properties of all dairy products;

(C) An improved presentation of milk and milk products to the public is also strongly recommended.

STATEMENT III

In the opinion of the Congress:

(A) One of the most important developments in relation to the dairy industry would be the acceptance, by the various countries concerned, of the same methods and standards for the performance-testing of dairy machinery, and the International Dairy Federation should give high priority to the consideration of this problem.

STATEMENT IV

In the opinion of the Congress:

(A) Fundamental research in dairy science is of primary and urgent importance for the future progress of the dairy industry. Such research must take into account the specific properties, such as flavor, physical characteristics, and possible nutritional factors not yet investigated, that are likely to be of particular importance to the consumer of dairy products.

STATEMENT V

In the opinion of the Congress:

(A) Every effort should be made by international and other organizations to remedy the present economically and socially unsound situation in

which large surpluses of milk and milk products occur in some countries, while at the same time very serious shortages exist in others.

No action on these statements was required by the Congress delegates.

SPECIAL LECTURE - THE PRODUCTION AND DISTRIBUTION OF DAIRY PRODUCTS

This lecture by A. H. Boerma, Director of the Economics Department of F.A.O., was a special feature of the closing session.

Mr. Boerma reviewed the activities and views of F.A.O. pertaining to dairying and the International Dairy Federation and International Dairy Congress. He reviewed briefly the activities of the Agricultural and Nutrition Divisions of F.A.O., and outlined the three main categories of F.A.O. work in the economics of the dairy industry, as follows: (1) The collection and dissemination of economic data on a world-wide basis; (2) the analysis of trends in world production, consumption, and trade in dairy products; and (3) special studies.

To illustrate the first category, he cited some of the principal economic documents issued by the F.A.O.; the second, two studies made to forecast possible changes in international trade in dairy products and in milk production; and the third, a recent F.A.O. paper on methods for stimulating milk consumption.

Mr. Boerma stressed the need for some coordination of the results of the work of international organizations.

In the final section of his paper, Mr. Boerma referred to the desirable increase in world milk production and to two specific problems: Butter and dried milk. He indicated the need for guidance on what should be done if demand for butter declines still further.

According to Mr. Boerma, the F.A.O. favors the International Dairy Federation and hopes that other countries will join the Federation, including all that have a substantial interest in dairying. The F.A.O. does not look on such organizations as competitors; rather, it looks on technical groups as supplementary to its own activities and as helpful in getting international cooperation.

Each country should, in the view of the F.A.O., prepare a policy for the development of the dairy industry, and the F.A.O. would be glad to render assistance in this endeavor. Each country should also engage in regional consultations, as well as contribute to world agricultural policy.

In his closing remarks, President Homan made a strong plea for non-member nations to join the International Dairy Federation, in order to strengthen the Federation and make it more world-wide in character. He stressed particularly the advantages of such action to countries in the tropical regions of the world. He indicated that the International Dairy Federation considers the problems confronting the dairy industry in tropical countries of such importance that it is establishing an international commission for tropical dairying to study the problems on an international scale.

Dr. Homan thanked the F.A.O. for helping to chart a course and establish objectives for the International Dairy Federation, the International Dairy Congress, and individual nations. He went on to thank all those who had contributed to the success of the Thirteenth International Dairy Congress. He also announced that the International Dairy Federation had

accepted the Italian invitation to hold the Fourteenth International Dairy Congress in Italy in 1956.

After several appreciatory comments by Congress officials, the President declared the Thirteenth International Dairy Congress to be closed.

OBJECTIVE APPRAISAL OF WORK AND ACCOMPLISHMENTS OF THE CONGRESS

As a source of new scientific information, a meeting such as the International Dairy Congress is a less gratifying and less profitable experience than a conference of scientific workers in the United States. Nevertheless, it is more challenging, and the results can be fully as useful.

Barriers of language, compounded by lack of common experience, and therefore understanding, among the participants make communication and exchange of information slow, cumbersome, and incomplete. The challenge lies in overcoming these difficulties.

The dairy industry in the United States operates under a wide variety of conditions, but conditions throughout the world vary to a much greater extent. Some of these conditions are differences in climate, and in sanitation, technological, and commercial factors. As a result, American delegates had difficulty understanding the significance of some discussions.

The attention that the International Dairy Federation is giving to problems of dairying in tropical countries is of special interest to the United States. Development of the dairy industry in these countries will open new markets for dairy products, dairy equipment, and breeding animals. It was apparent that the countries of Western Europe must depend greatly on exports of agricultural commodities, including dairy products, to maintain a favorable trade balance, and they hope to obtain as much as possible of this potential market. The United States also exports large quantities of agricultural commodities and could export more of its dairy products to tropical countries. Specialists in the United States can contribute much to the Congress programs in this area.

RECOMMENDATIONS CONCERNING FUTURE CONGRESSES

The United States delegation is agreed that this country has much to gain by being represented at all future International Dairy Congresses. Discussion and study of the results produced by scientific dairy research in many countries afford immeasurable advantages to the dairy industry in the United States. Moreover, aside from the benefits to be gained by an exchange of ideas on the numerous scientific and practical subjects relating to the dairy industry, the mutual respect and understanding that can be gained from direct communication with people from many nations who have a common interest in an industry such as the dairy industry can hardly be exaggerated.

To take full advantage of this opportunity does not necessarily require affiliation with the International Dairy Federation. The gains from such an affiliation must be weighed against the obligations that might be imposed by the sponsoring group for the Congress. However, the delegates must be selected carefully to assure dignified, qualified representatives who are competent to contribute to and benefit from the discussions scheduled for the Congress.

A total of 327 papers covering all phases of the dairy industry were submitted for discussion at this Congress, and of this number 15 were from the United States. Dairy scientists in this country should make every effort to submit more papers for discussion at future congresses, and especially more papers dealing with fundamental research in dairy science.

It seems imperative that the United States participate in future congresses if a position of world leadership is to be maintained.

The delegation from the United States wishes to thank the officials of the Netherlands Government and of the Thirteenth International Congress for the many honors and courtesies they extended to the delegation on this occasion.

An annex consisting of a special paper on "The Dutch Dairy Industry," by Dr. R. E. Hodgson, chairman of the American delegation, follows:

THE DUTCH DAIRY INDUSTRY

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Introduction

Following the conclusion of the Congress I was accorded the privilege, through the cooperation of the Netherlands Ministry of Agriculture, Fisheries, and Food and the American Embassy, of studying a number of the programs that are directed toward improving dairy cattle and dairy farming in the Netherlands. In this study I visited some of the Ministry offices and laboratories, the experiment stations, one of the herdbook societies, artificial-breeding centers, and a number of dairy farms. Unfortunately, time did not permit a similar study tour of the factories, processing plants, etc., to survey this important phase of the Dutch dairy industry.

I was impressed by the advanced position of the Dutch dairy farmer with regard to the development of adaptable, productive dairy cattle. The feeding and management practices that prevail on farms provide conditions which enable the cows to maintain themselves and produce large quantities of milk and meat, mainly from home-produced feeds composed largely of forages. I was especially impressed by the fine pastures and the efficient management practices that bring about a high degree of pasture utilization through grazing. At the same time I saw great need for improvement in the methods of preserving forage as hay for use during the nonpasture season, which lasts about 6 months. Progress is being made to improve this situation by making grass silage and artificially-dehydrated grass from the hay crop.

It was apparent that the educational, extension, and experiment station programs are close to the farmer and that farm application of improved practices is rapid. A review of the economic position of the Dutch dairy industry, including my observations of some of the more important programs, follows.

Economic Importance of Dairying

The importance of the dairy industry to the Dutch national economy can be indicated by a few statistics. It is estimated that more than half the productive land in the Netherlands is used for milk production. The produce of this land, together with an annual importation of about 200 metric tons of concentrates (high-protein meals), supports a cattle population of about 2.9 million head. Most of these cattle are dairy animals or of dairy origin. Of this number about 1.5 million head are classed as cows kept for milk production. The average production per cow in 1952 was 8,250 pounds of milk testing 3.65 percent of butterfat.

In addition to the approximately 5,000 farms that produce cheese, there are about 600 factories that handle milk for processing into products. Milk and its products are made available to consumers through some 5,600 retail shops. Another 5,800 venders (retail traders not operating shops) and 867 wholesalers are engaged in marketing dairy products.

More than 300 thousand families derive their living from cattle farming and about 14 percent of the total population labor in some phase of the dairy industry.

The supply of milk produced in 1952 was used as follows:

		Metric tons
1.	Used on farms (cheese making, human and animal consumption).....	946,000
2.	Consumed in whole milk areas.....	30,000
3.	Delivered to dairies.....	4,586,000
4.	Whole milk used (standardized to 2.5% butterfat content.....	1,565,000
5.	Skim milk and buttermilk.....	190,000
6.	Milk used for condensed milk.....	559,000
7.	Milk used for milk powder.....	460,000
8.	Milk used for factory cheese.....	1,223,000
9.	Milk used for casein.....	16,000
10.	Milk used for miscellaneous purposes.....	86,000
11.	Milk used as cream.....	12,000
12.	Milk used for butter.....	73,000

The per capita consumption of milk and its products in 1952 was as follows:

		Pounds			Pounds
1.	Fluid milk.....	473	4.	Cream.....	1.8
2.	Butter.....	6.2	5.	Milk powder.....	1.3
3.	Cheese.....	11.7	6.	Condensed milk.....	2.2

Exports of dairy products in 1952 were as follows:

		Metric tons			Metric tons
1.	Cheese.....	78,100	3.	Butter.....	49,900
2.	Condensed milk.	199,300	4.	Milk powder....	36,900

Dairy products accounted for more than 10 percent of the total value of the Dutch export trade.

National Dairy Organizations

Dairy farmers and handlers of milk are very well organized. It may be of interest to list here the more important dairy industry organizations.

1. Royal Netherlands Dairy Federation. - This is a federation of regional and local cooperatives.
2. Society of the Dairy Industry and of Milk Hygiene. - This is a federation of private companies making and handling dairy products.
3. Union of Cheese-making Farmers.
4. Central Dairy Committee. - This is a quasi-government organization which functions to bring together the above-mentioned cooperative and independent organizations and societies.
5. Cooperative Dairy Produce Marketing Associations. - As the name implies, these are marketing associations of cooperative dairy associations. There are seven of these in the various districts of the Netherlands.

In addition to these national organizations, there are many provincial and local societies of farmers of different kinds which have for their purpose the improvement of various aspects of dairy farming. The Dutch appear to be very cooperative minded and do things by joint action and effort. In this the Government, through the Ministry of Agriculture, Fisheries and Feeds, evidently gives them every encouragement. Some of these societies are responsible in the local areas, under Ministry supervision, for the coordinated national improvement programs, such as cow testing and artificial breeding.

Netherlands Dairy Research

The Dutch dairy farmers and dairy manufacturers have a keen interest in research as a means of advancing the dairy industry. The Ministry sponsors an active research program of aid to the dairy industry. Much of the cost of this research and a considerable amount of the programing of research is done by the local and national societies working under the general guidance of the Ministry. The principal dairy research stations are as follows:

1. Netherlands Institute of Dairy Research (NIZO). - This is a new research station now being built in the vicinity of the University of Wageningen. The program at this station will be devoted mainly to basic and applied research on milk and milk products. While the director of the station is in the Ministry of Agriculture, the financial support and guidance of the program will come largely from the dairy industry.
2. Government Dairy Station, Leyden. - This station is largely one for control work and the development of methods and techniques for the control of dairy products.
3. Laboratory of Dairying, College of Agriculture, University of Wageningen. - This laboratory has a well-developed research program on dairy-cattle production, nutrition and physiology, and on the technology of milk and milk products. In addition, the College is the principal institution for advanced training for dairy scientists and technologists.
4. State Agricultural Experiment Station, Hoorn. - This is one of the older stations. Its program is directed mainly at feeding and management and the nutritional evaluation of feeds. I visited this station and found a well-equipped staff with adequate laboratory and farm facilities for doing research. It is held in high regard by the farmers of the vicinity.
5. Veterinary College, University of Utrecht. - This institution does the research and supervises much of the control work on animal diseases in the Netherlands. The country is putting forth a concerted effort to rid the cattle population of T.B. and Bang's disease. This institution is doing considerable work, as is another veterinary laboratory in Amsterdam, on foot-and-mouth disease. It also is giving considerable attention to the problem of sterility in cattle and to this end is working closely with the artificial-insemination program.
6. Research laboratories in dairy factories. - There are a number of such laboratories that have for their purpose working out problems related to the processing of milk and its products. Two examples of such laboratories are (a) Laboratory of the Provincial Union of Cooperative Dairy Factories, and (b) Laboratories of the Royal Netherlands Dairy Federation.
7. Provincial farms and experiment stations. - A number of the provinces, or societies of farmers in the provinces, maintain small farms for testing and demonstration purposes.

Netherlands Dairy Extension

There is a very well organized program for extension and rural education in the Netherlands. It operates as an advisory service under the National Livestock and Agricultural Service of the Ministry of Agriculture. Livestock advisors and other specialists are stationed in each province and a number also work out of the Ministry office. In addition, this service makes available through appropriate laboratories a program for soil testing and feed analysis. The advisory service also has over-all supervision of the production-testing and artificial-insemination programs.

In addition to the advisory service there are available a number of training courses to prepare farmers and young people for dairy farming and dairy work. There are well organized primary agricultural schools, agricultural winter schools, agricultural evening classes, secondary agricultural schools, and the Agricultural University at Wageningen to meet the needs of rural people for education.

Dairy Cattle Improvement Programs

Three principal breeds of cattle are used for milk production in the Netherlands. While there are also a few herds of beef cattle, the principal supply of beef comes from dairy animals. In this respect it is interesting to observe the attention that farmers give to the development of meat qualities in their dairy cattle without sacrificing milk-producing ability. Breeders refer to their efforts to develop well-muscled animals, and in this they seem to be doing a good job. Much attention is given to growing out male animals, largely fed on grass, and those not selected for future breeding purposes are used for meat. The cows no longer useful for milk production make desirable meat carcasses, by virtue of their well-developed muscles and good covering of flesh.

Of the three breeds of cattle, the Friesian-Holland breed (black and white) is the most popular, comprising over 70 percent of all dairy cattle. Cows of this breed are said to be the best milkers. This breed originated in the Province of Friesland and is popular over most of the country but especially in the north.

The Meuse-Rhine-Ijssil breed (red and white) represents about 25 percent of the dairy-cattle population. It is most popular in the south and southeast. This breed is larger and heavier than the black and white breed and, while the cows are good milkers, they are also good beef animals. The milk of this breed is slightly lower in fat than that of the black and white breed.

The Groningen breed (black with a white face) makes up the remaining 5 percent of the dairy-cattle population. It is popular in the northeast and to some extent in the west. It is the best beef type of the three but is also a good milker. It is gaining in popularity.

There are three nationwide coordinated programs concerned with dairy-cattle improvement: (1) The production-testing program; (2) the artificial-insemination program; and (3) the herdbook registry.

These programs are under the general supervision of the Ministry of Agriculture, but usually are administered locally by societies of local farmers.

The Production-Testing Program

The objective of this program is to advance the economic position of the farmer and the breeding improvement of cattle. In 1952, 820 thousand cows, or 55 percent of the milk cows, were enrolled in the testing program. The average production of recorded cows was 9,042 pounds of milk and 331 pounds of butterfat; the average test was 3.66 percent butterfat. The production by breeds was as follows:

Breed:	Milk (lbs.)	Butterfat (%)	Butterfat (lbs.)
Black and white	9,245	3.82	353
Red and white	8,888	3.56	316
Black with white face	9,071	3.81	346

More than 1,100 local milk-recording societies (associations) were operating in 1952. The government subsidizes testing, and its funds for this purpose are provided mainly by collecting 5 cents for each 100 kilograms of milk produced by all farmers, whether or not their cows are tested. Participating farmers pay the remainder of the cost at a so-much-per-cow fee. The subsidy and other costs to the farmer vary according to the size of his herd, the smaller farmers being given greater consideration. The costs vary also according to the frequency of the test which is made at 2, 3, or 4 weekly intervals. About 49 percent of the herds are tested once every 2 weeks, 44 percent are tested once in 3 weeks, and 7 percent once in 4 weeks.

The local testing association is under the control of a local recording society, which is under the supervision of the Provincial Milk Recording Society. The local society employs a sampler, who takes the milk samples, and a tester, who tests the samples at a central laboratory and records the results. The recorded amount of milk and fat is checked and approved by the Provincial Milk Recording Society, after which a copy of the record is returned to the farmer and also forwarded to the office of the National Milk Recording Society and to the offices of the herdbook societies. All of this is done according to rules and specifications laid down by the National Milk Recording Society and the Ministry of Agriculture. The records are used by farmers, breeders, and the government in improvement programs.

On visiting the National Milk Recording Society offices at Arnheim, I observed the manner in which the records were received, processed, and analyzed. Considerable progress has been made in mechanizing the operation, but as yet the office had not the advantages of the latest machines that would greatly simplify and speed up the work of dealing with the records involved.

The Artificial-Insemination Program

The objective of this program is (1) to improve the quality of dairy cattle and (2) to control sterility (especially bull-borne diseases). Like in other countries, this program has grown rapidly in the Netherlands,

as shown below:

Year:	Cows inseminated	Percentage of all breeding females
	Number	Percent
1946	17,000	1
1949	245,000	12
1952	665,000	33

The use of artificial insemination is under the control of the Ministry of Agriculture, Fisheries and Food, which grants permission for its use to artificial-breeding societies only. Its use by individual breeders is forbidden. The program is carried on through local artificial-breeding societies which are responsible to a central committee which supervises the program. This committee is composed of farmers, breeding experts, and veterinarians. There is also a similar committee for each province. There are about 700 local breeding societies, many of which are concerned with artificial breeding. At present there are 21 bull studs located throughout the country.

Local societies, to receive permission to use artificial breeding, must agree (1) to submit to the supervision of the Provincial and Central Artificial Breeding Committee, (2) to use bulls that meet standards for type and production, (3) to employ certified veterinarians as technicians, (4) to submit herd (if more than 4 cows) to milk recording, (5) to inseminate all cows in the herd, and (6) to register all AI progeny.

The government subsidizes the artificial-breeding program by paying part of the cost to small farmers. It also makes grants for construction of AI centers.

Bulls used in insemination studs must (1) be from dams and granddams that meet minimum production requirements for milk and butterfat test; (2) pass a rigid test for semen quality, (3) be free of disease, and (4) be of acceptable type.

About 30 percent of the bulls inspected for entry to a breeding stud are rejected for one reason or another. In 1952, the average rate of conception after first service was 56 percent, and 89 percent of all cows bred were gotten in calf. The average number of breedings per conception was 1.8. In 1952, 777 bulls were maintained in studs, of which only 100 were over 6 years old.

The value of a bull for use in artificial breeding is judged by (1) transmitting ability for milk and fat production; (2) heritability of milking ability; and (3) quality of offspring as regards health, fecundity, and heritable defects. Bulls for artificial breeding are not selected on the basis of their daughters' production compared with that of the daughters' dams but on the basis of the average production of the first 100 unselected AI daughters.

The cost to the farmer for artificial-breeding service amounts to about 10.5 guilders ($3.00) per cow.

The Herdbook Registry

There are two herdbook societies in the Netherlands; (1) The Friesian Cattle Herdbook Society (confined to the Province of Friesland and registering only the black and white Friesian-Holstein breed); and (2) the Netherlands Cattle Herdbook Society, which extends its activities over the rest of the country and which registers animals of all breeds.

The objectives are to register the identity and excellence of the

cattle of the members of the societies. The herdbook societies are progressive in that they have a provision, through auxiliary herdbooks, for a breeder to develop a registered herd from grade animals by following a specified progressive breeding program. All animals admitted to the herdbooks proper must be inspected and meet minimum requirements for type conformation.

In addition to the herdbooks proper and the auxiliary herdbooks, each society keeps special registers which are known as "The Register for Preferent Sires" and "The Register for Preferent Dams."

The registry for preferent sires recognizes older bulls. They are given this rating after they and their daughters have been inspected by a competent committee of judges and have met certain rigid type standards. The daughters must also meet minimum production standards, and their records are compared with their dams' records. Preferent A and B classes are established with a difference in the type and production standards required. Sires must be 7 to 8 years old before they can qualify for this registry. The requirements are so rigid that only a few bulls are admitted to the preferent registry.

The registry for preferent dams is much the same. Cows must meet the same rigid type standards as do their offspring. In addition, they must have production records well above the average for the breed and have daughters whose type and production meet these same standards.

The herdbook societies also foster other activities to advance the breeds, such as cattle shows, sales, and disease-control programs. They work closely with the production-testing and artificial-insemination programs.

In 1951 the Netherlands Herdbook Society had a membership of 35,659 and registered 78,167 calves. The Friesian Herdbook Society in 1951 had a membership of 5,766 and registered 42,786 calves.